

Perceptions of the environment and environmental issues in Stellenbosch, South Africa: A mixed-methods approach

Corlia Meyer

Dissertation presented for the degree of Doctor of Philosophy in the Faculty of Arts and Social Sciences at Stellenbosch University



UNIVERSITEIT
iYUNIVESITHI
STELLENBOSCH
UNIVERSITY

100
1918 · 2018

Supervisor: Professor Peter Weingart

December 2018

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

Declaration

By submitting this thesis/dissertation³ electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Abstract

The issue of environmental perceptions is an important research area. Due to increased environmental degradation from human activities, concern for the environment is growing. Successful environmental management cannot be achieved without understanding the perceptions that people have of the environment. If human behaviour towards the environment is to be changed, it is important to know how environmental perceptions are formed and where information about the environment comes from. This research aims to contribute to the literature by examining the public's perceptions of the environment in Stellenbosch, a town in the Western Cape, South Africa.

The reasons for and consequences of environmental issues are unevenly distributed around the world, with developing nations being more susceptible to environmental damages. Concern for the natural environment was historically limited to developed nations, but this concern spread globally during the late 20th century. Three waves for environmental concern exist. The first wave (1940 – 1950) was when people realised that the earth has limited resources. During the second wave (1960 – 1970) production and consumption created by-products and waste, and during the third wave (1980 – 1990) specific global environmental problems, such as climate change and ozone depletion, appeared. The globalisation of environmental concern has made the research of environmental perceptions of developing nations crucial. Perceptions of the environment and environmental issues can serve as indicators of actual environmental degradation, it can influence the public's participation in environmentally friendly activities, and it can influence an individual's pro-environmental behaviour.

To the researcher's knowledge this is the first study investigating socio-demographic and environmental communication variables influencing the public's perceptions about the environment and environmental problems, in a town in the Western Cape, South Africa. The research questions include: How do the public perceive the environment and environmental problems? Are these perceptions influenced by socio-demographic factors such as gender, ethnic group, age, religious affiliation, education and income? What sources of environmental information do the public use to get informed about the environment? How knowledgeable are individuals about the environment? Is there a relationship between environmental knowledge and information sources used? What are the strongest variables influencing perceptions about the environment? How do publics differ in their perceptions about the environment?

The literature review revealed eight hypotheses. Television is the media source that will be most used by the public for information about the environment. Individuals with high levels of education will be more knowledgeable about the environment and view environmental problems as more serious. Individuals that do not belong to a specific religion will be more concerned about the environment. White South Africans will perceive environmental problems as more serious than other population groups. Younger individuals will be more concerned about the environment.

A mixed method approach is used for the data collection. Data collection took place in four neighbourhoods in Stellenbosch, South Africa. The first phase uses surveys as a data collection tool. It helps to identify the variables that influence environmental perceptions. Hundred and ninety-one adults from various socio-demographical backgrounds were interviewed. Fifteen interviews with respondents from within the quantitative sample were completed to collect the qualitative data.

Respondents from the Stellenbosch public perceived the natural environment in terms of three themes: natural or nature, vegetation and animals. The population did not perceive environmental problems as a serious social problem and ranked crime, poverty and corruption as the three most serious social problems South Africans have to deal with. Of the environmental problems, the respondents perceived water scarcity (drought), climate change and pollution as the top three most severe environmental problems South Africans face. The gender, population group, socio-economic status and level of education of an individual influenced how serious a respondent perceived environmental problems. The sample public have relatively good knowledge about the environment and environmental problems. The population group, socio-economic status and level of education played a role in how knowledgeable an individual is about the environment. The source the respondents use to most to access information about the environment is television. This is followed by personal sources (family and friends) and newspapers. Population group, age and socio-economic status as variables influenced the source an individual used to access environmental information. Two hypotheses were rejected. Age and religion did not influence how serious an individual perceived the environment. Of all the variables, environmental knowledge, gender and the population group of an individual are the variables with the strongest influence on the Stellenbosch sample's perceptions about the environment.

The dissertation also makes a distinction between four different Stellenbosch publics, based on environmental knowledge, environmental perceptions and environmental information sources used. Two of the publics have lower levels of environmental knowledge and perceive environmental problems as less serious. The other two publics have higher levels of environmental knowledge and perceive environmental problems as more serious.

Overall, the research has confirmed some previous findings that female, Caucasian individuals with high levels of education and income perceived environmental problems as more serious and are more concerned about the environment. This research should inform environmental conservation policies and management. When policies are created, they should be aimed at those who are less educated about the environment and are less concerned about the environment.

Opsomming

Persepsies van die omgewing is 'n belangrike navorsingsarea. Kommer oor die omgewing vermeerder as gevolg van toenemende agteruitgaan van die omgewing, wat veroorsaak word deur menslike aktiwiteite. Suksesvolle omgewingsbestuur kan nie gebeur sonder om mense se persepsies van die omgewing te verstaan nie. As menslike gedrag teenoor die omgewing verander moet word, is dit belangrik om te weet hoe die persepsies van die omgewing gevorm word en waar inligting oor die omgewing vandaan kom. Hierdie navorsingsprojek poog om by te dra tot die literatuur deur die publiek se persepsies van die omgewing in Stellenbosch, 'n dorp in die Wes-Kaap, Suid-Afrika, te ondersoek.

Die redes vir en gevolge van omgewingsprobleme word oneweredig versprei oor die wêreld, met ontwikkelende lande meer vatbaar vir omgewingsveranderinge. Histories is bekommernisse oor die omgewing beperk tot ontwikkelde lande, maar hierdie bekommernis het wêreldwyd versprei gedurende die laat 20ste eeu. Drie fases van besorgdheid vir die omgewing bestaan. Tydens die eerste fase (1940 – 1950) het mense besef dat die aarde beperkte hulpbronne het. Met die tweede fase (1960 – 1970) het produksie van goedere en industriële afvalprodukte geskep, en tydens die derde fase (1980 – 1990) het spesifieke wêreldwye omgewingsprobleme, soos klimaatsverandering en osoonbeskading, ontstaan. Die globalisering van omgewingsbesorgdheid het die navorsing van omgewingspersepsies in ontwikkelende lande nodig gemaak. Persepsies van die omgewing en omgewingsprobleme kan as aanwysers dien van werklike omgewingsverval, dit kan die publiek se deelname aan omgewingsvriendelike aktiwiteite beïnvloed, en kan 'n individu se pro-omgewingsgedrag affekteer.

Tot die wete van die navorser is dit die eerste studie wat sosio-demografiese- en omgewingskommunikasie veranderlikes wat die publiek se persepsies oor die omgewing en omgewingsprobleme beïnvloed ondersoek, in 'n dorp in die Wes-Kaap, Suid-Afrika. Die navorsingsvrae sluit in: Hoe verstaan die publiek die omgewing en omgewingsprobleme? Word hierdie persepsies beïnvloed deur sosio-demografiese veranderlikes soos geslag, bevolkingsgroep, ouderdom, godsdienstige affiliasie, opvoeding en inkomste? Watter inligtingsbronne gebruik die publiek om op hoogte te bly van omgewingsnuus? Watter vlak van kennis het individue oor die omgewing? Is daar 'n verhouding tussen omgewingskennis en inligtingsbronne wat gebruik word? Wat is die veranderlikes wat persepsies oor die omgewing die meeste beïnvloed? Hoe verskil publieke in hul persepsies van die omgewing?

'n Studie van die literatuur het agt hipoteses onthul. Televisie is die mediabron wat die meeste deur die publiek gebruik word om inligting oor die omgewing in te samel. Individue met hoër vlakke van opvoeding sal meer kennis hê oor die omgewing en sal omgewingsprobleme as ernstiger beskou. Individue wat nie aan 'n spesifieke godsdienst behoort nie, sal meer bekommerd wees oor die omgewing. Wit Suid-Afrikaners sal omgewingsprobleme as ernstiger beskou in vergelyking met ander bevolkingsgroepe en jonger individue sal meer bekommerd wees oor die omgewing.

Die navorser gebruik gemengde-metode navorsing vir die data-insameling. Data-insameling vind plaas in vier woonbuurte in Stellenbosch, Suid-Afrika. Die eerste fase gebruik opnames as 'n data-insamelingsinstrument. Dit help om die veranderlikes wat perspesies van die omgewing beïnvloed, te identifiseer. Daar is opnames gedoen van 191 volwassenes uit verskillende sosio-demografiese agtergronde. Vyftien onderhoude met individue van binne die kwantitatiewe steekproef is voltooi om die kwalitatiewe data te versamel.

Individue van die Stellenbosch publiek het die natuurlike omgewing verstaan in terme van drie temas: natuurlik of natuur, plantegroei en diere. Die steekproef bevolking het nie omgewingsprobleme as 'n ernstige sosiale probleem beskou nie en het misdaad, armoede en korrupsie beskou as die drie ernstige sosiale probleme wat Suid-Afrikaners beïnvloed. Vanuit die omgewingsprobleme is waterskaarste (droogte), klimaatsverandering en besoedeling beskou as die top drie ernstige omgewingsprobleme wat Suid Afrikaners affekteer. 'n Individue se geslag, bevolkingsgroep, sosio-ekonomiese status en vlak van opvoeding beïnvloed hoe ernstig die persoon omgewingsprobleme beskou. Die ondersoekte persone het relatiewe goeie kennis oor die omgewing en omgewingsprobleme. Bevolkingsgroep, sosio-ekonomiese status en vlak van onderwys het 'n rol gespeel in hoe kundig 'n individu oor die omgewing is. Televisie is hoofsaaklik die bron wat die individue gebruik om inligting oor die omgewing te kry. Dit word gevolg deur persoonlike bronne (familie en vriende) en koerante. Bevolkingsgroep, ouderdom en sosio-ekonomiese status as veranderlikes, het die bron beïnvloed wat 'n individu gebruik het om toegang tot omgewingsinligting te verkry. Uiteindelik is twee hipoteses verwerp. Ouderdom en godsdiens het geen invloed gehad op hoe ernstig 'n individu omgewingsprobleme beskou het nie. Van al die veranderlikes het kennis oor die omgewing, geslag en bevolkingsgroep die sterkste invloed gehad individues se persepsies oor die omgewing in die Stellenbosch area.

Die navorser tref onderskeid tussen vier verskillende Stellenbosch-publieke, gebaseer op omgewingskennis, omgewingspersepsies en omgewingsinligtingsbronne. Twee van die publieke het laer vlakke van omgewingskennis en beskou omgewingsprobleme as minder ernstig. Die ander twee publieke het hoër vlakke van omgewingskennis en beskou omgewingsprobleme as meer ernstig.

Die navorsing het vorige bevindings bevestig dat vroulike, wit individue met hoër vlakke van opvoeding en inkomste, omgewingsprobleme as meer ernstig sien, en meer bekommerd is oor die omgewing. Hierdie navorsing behoort omgewingbewaringsbeleide en -bestuur inlig en ondersteun. Wanneer 'n beleid geskep word, moet kommunikasie daarvan gemik wees op diegene wat minder kennis oor die omgewing het en minder bekommerd oor die omgewing is.

Acknowledgements

I would like to thank all those whose assistance proved to be unmeasurable in the success of my end goal, this dissertation.

First and foremost, I would like to express my sincere gratitude to my advisor and supervisor, Professor Peter Weingart, the South African Research Chair in Science Communication at Stellenbosch University. Thank you for the continuous knowledge, support, motivation and enthusiasm during my times as your student. Thank you for your guidance, without which this research would not have been possible. You allowed the research to be my own work but steered me in the right direction when needed. Thank you also for your support during problems in my personal life. I could not have asked for a better supervisor. Besides my supervisor, I am also eternally grateful to Dr Lars Guenther. Without your knowledge, patience and friendship this would have been a much more difficult journey.

I would also like to express my gratitude to all the staff at the Centre for Research on Evaluation, Science and Technology (CREST), for creating a supportive and functional working environment, and willingness to help when asked. I would particularly like to single out, Professor Johan Mouton, Marthie van Niekerk, Bernia Drake and Nigel Jansen for academic, moral, technical and personal support. My biggest thanks go out to my colleague, Harrie Esterhuyse, you became a true friend during the time of our doctoral research. My sincere thanks also for the financial support provided by CREST and the National Research Foundation.

Thank you to my research assistants, Peter O'Connor, Eugene Marais, Frowin Becker, Chris Brown, Lulama Magenuka, Sindile Khani and Lehlohonolo Mngomezulu. Your determination to complete the work was truly inspiring. Thank you to the staff at the Stellenbosch Municipality for providing space to do interviews. Thank you also to the 191 individuals who were willing to be interviewed. Without your input, this research would not have been possible.

Even with the professional assistance I received, I would be nowhere without my family: my parents, Wilhelm and Estè Meyer and my sisters, Tina-Mari and Adri Meyer. Your love, support, guidance and interest in my research was a driving force without which this research would not have been completed in time. Thank you also for your sympathetic ear and wise counsel when asked (or not asked). Special thanks to my good friend, Nanike Esterhuizen. You were always willing to take a mid-morning coffee break and discuss our research. In addition, thank you to my other friends, the family we choose. You were always happy to talk about my research, but also other things when I needed a distraction. And last, but certainly not least, I would like to thank my partner, Alain Lotriet. You were as much part of this journey as I was.

Dedication

To my parents.

Also, to my late grandfather, Dr P.S. Meyer, who, even in his absence, inspired me to complete this dissertation.

Table of contents

Declaration	i
Abstract	ii
Opsomming	iv
Acknowledgements	vi
Dedication	vii
Table of contents	viii
List of figures	xii
List of tables	xiv
List of abbreviations and acronyms	xvi
Chapter 1: Introduction	1
1.1. Dissertation overview and structure	2
Chapter 2: Background, history, supporting theory and research questions	3
2.1. Problem statement	3
2.2. Research background	3
2.2.1 Global environmental concern	3
2.2.2 Global environmental perceptions	6
2.2.3 Environmental perceptions, socio-demographic variables, environmental knowledge and the media	7
2.2.4 Environmental communication	9
2.3. A brief history of South Africa's environmental challenges	11
2.4. Potential value of the research	14
2.5. Supporting theory and conceptual framework	17
2.5.1 Environmental communication framework	20
2.5.2 Environmental perceptions framework	22
2.6. Problem statement and research questions	23
2.6.1 Research questions	23
Chapter 3: Literature review	26
3.1. Introduction	26
3.2. International environmental perceptions	26
3.3. Environmental communication	27
3.3.1. Environmental communication and the media	29
3.3.2. Environmental knowledge	32
3.3.3. Environmental communication and policies	33
3.4. Socio-demographic variables influencing environmental perceptions	35
3.4.1. Religious orientation	36
3.4.2. Gender	36

3.4.3.	Population group	38
3.4.4.	Age	38
3.4.5.	Household income	39
3.4.6.	Education	41
3.5.	Segmentation research	42
3.6.	Conclusions	42
Chapter 4:	Research design and methods	45
4.1.	Research location	46
4.2.	Data collection	48
4.3.	Quantitative data collection	49
4.3.1.	Survey design	50
4.3.2.	Measures	51
4.3.3.	Research assistant selection and training	52
4.3.4.	Population	53
4.4.	Quantitative data analysis	55
4.4.1.	Descriptive statistics	55
4.4.2.	Inferential statistics	60
4.5.	Qualitative data collection	61
4.5.1.	Questionnaire design	62
4.5.2.	Interview sample	63
4.6.	Qualitative data analysis	64
4.6.1.	Descriptive statistics	64
Chapter 5:	The most important environmental issues facing SA, main environmental information sources used and general knowledge about the environment	66
5.1.	Introduction	66
5.2.	Results	66
5.2.1.	Defining the environment	66
5.2.2.	The ranking of environmental problems in comparison to other South African social problems	66
5.2.3.	Ranking of environmental problems facing South Africa	68
5.2.4.	General use of environmental information sources	72
5.2.5.	General environmental knowledge	75
5.2.6.	The relationship between environmental knowledge and information sources	77
5.3.	Discussion	78
5.3.1.	Defining the environment	78
5.3.2.	The ranking of environmental problems in comparison to other South African social problems.	78
5.3.3.	The ranking of environmental problems in South Africa	78

5.3.4.	General use of environmental information sources	79
5.3.5.	General environmental knowledge	81
5.4.	Conclusions	82
Chapter 6: The influence of socio-demographic variables on environmental perceptions, environmental information sources and environmental knowledge		83
6.1.	Introduction	83
6.2.	Results	83
6.2.1.	Socio-demographic variable influences and information sources, knowledge and perceptions of environmental challenges	83
6.3.	Discussion	102
6.4.	Conclusions	108
Chapter 7: The strongest factors influencing the public's perceptions of the environment		110
7.1.	Introduction	110
7.2.	Results	110
7.2.1.	Correlation analysis	110
7.2.2.	Regression analysis	110
7.3.	Discussion	112
7.4.	Conclusion	112
Chapter 8: Stellenbosch publics and their differences in perceptions toward environmental challenges		114
8.1.	Introduction	114
8.2.	Results	114
8.2.1.	Cluster analyses	114
8.2.2.	Stellenbosch publics	119
8.3.	Discussion	123
8.4.	Conclusion	125
Chapter 9: Conclusions, limitations and recommendations		126
9.1.	Introduction	126
9.2.	Conclusions	126
9.3.	Limitations and recommendations for future research and environmental communication	130
Conflict of interest		132
References		133
Addenda		156
Addendum 1: Quantitative survey schedule		156
Addendum 1A: English		156
Addendum 1B: Afrikaans		164
Addendum 1C: Xhosa		172
Addendum 2: Survey code book		180
Addendum 3: Field assistant confidentiality agreement		184

Addendum 4: Field assistant indemnity form	185
Addendum 5: Survey verbal consent form	187
Addendum 6: Qualitative interview questionnaire	188
Addendum 6A: English	188
Addendum 6B: Afrikaans	191
Addendum 7: Interview information and verbal consent	194
Addendum 8: Qualitative analysis code book	195

List of figures

Figure 2.1. Basic conceptual framework	19
Figure 2.2. Conceptual framework with research questions	24
Figure 3.1. Theorised behavioural change system (Hungerford & Volk, 1990:258)	27
Figure 3.2. Model of pro-environmental behaviour according to Kollmuss and Agyeman (2002)	28
Figure 3.3. Conceptual framework including hypotheses	41
Figure 4.1. Methodological framework for the study	44
Figure 4.2. Map of South Africa indicating the location of the Western Cape (Source: http://d-maps.com/carte.php?num_car=4415&lang=en ; accessed 26 July 2017)	45
Figure 4.3. Map of the Western Cape indicating the location of Stellenbosch (Source: http://d-maps.com/carte.php?num_car=89813&lang=en ; accessed 26 July 2017)	46
Figure 4.4. Geographical map of neighbourhoods where the data collection took place (Source: Google Earth)	53
Figure 4.5. Road map of neighbourhoods where the data collection took place (Source: https://www.google.co.za/maps/@-33.9294257,18.85666,13.7z?hl=en ; accessed 26 July 2017)	53
Figure 5.1. Percentage of respondents' answers to Likert-scale questions about the perceived seriousness of South Africa's social problems	65
Figure 5.2. Percentage of respondents' answers to Likert-scale questions about the seriousness of South Africa's environmental problems	68
Figure 5.3. Percentage of respondents' answers to Likert-scale questions on how often they use various sources to access environmental information	70
Figure 6.1. Gender: perceived seriousness of ocean pollution as an environmental problem	79
Figure 6.2. Gender: perceived seriousness of endangered species as an environmental problem	79
Figure 6.3. Population group: online source use to access environmental information	80
Figure 6.4. Radio use to access environmental information	81

Figure 6.5. Population group: perceived seriousness of water scarcity as an environmental problem	83
Figure 6.6. Population group: perceived seriousness of habitat destruction as an environmental problem	83
Figure 6.7. Population group: perceived seriousness of overfishing as an environmental problem	84
Figure 6.8. Population group: perceived seriousness of fresh water pollution as an environmental problem	84
Figure 6.9. Population group: perceived seriousness of ocean pollution as an environmental problem	85
Figure 6.10. Population group: perceived seriousness of wildlife poaching as an environmental problem	86
Figure 6.11. Population group: perceived seriousness of endangered species as an environmental problem	86
Figure 6.12. Population group: perceived seriousness of climate change as an environmental problem	87
Figure 6.13. Age: online source use to access environmental information	88
Figure 6.14. Age: radio use to access environmental information	89
Figure 6.15. Household income: online source use to access environmental information	90
Figure 6.16. Education: online sources use to access environmental information	93
Figure 6.17. Education: newspaper use to access environmental information	93
Figure 8.1. Visual representation of clusters	110
Figure 9.1 Revised theoretical model for Stellenbosch environmental perceptions, information sources and environmental knowledge	118

List of tables

Table 2.1. Three waves of concern regarding the environment (Ruttan, 1993)	5
Table 2.2. Literature supporting the environmental perceptions conceptual framework	17
Table 4.1. Average monthly household income for citizens from Stellenbosch (Stats SA, 2011)	47
Table 4.2. Socio-demographic characteristics (profile) of the quantitative sample	55
Table 4.3. Socio-demographic characteristics (profile) of the qualitative sample	63
Table 5.1. Frequency of top seven themes that were mentioned by respondents ($N = 191$) regarding what they associate with the natural environment	64
Table 5.2. Comparison of the severity of social challenges and issues in South Africa using a Likert-scale	65
Table 5.3. Frequency of top ten themes that were mentioned by respondents regarding national environmental problems	66
Table 5.4. Comparison of the severity of environmental challenges and issues in South Africa using a Likert-scale	67
Table 5.5. Comparison of the significance of environmental challenges in South Africa in neighbourhoods of different socio-economic statuses	69
Table 5.6. Comparison of sources used to get information about the environment and environmental problems using a Likert-scale	70
Table 5.7. Frequency and percentage of respondents who answered true-or-false questions about environmental topics correctly ($N = 191$)	71
Table 5.8. Respondent groupings regarding their knowledge about the environment	71
Table 5.9. Frequency and percentage of respondents who were unable to answer the true-or-false questions about environmental topics ($N = 191$)	72
Table 5.10. Correlation between environmental knowledge and various information sources	72
Table 6.1. Gender: seriousness (m) of environmental problems	78
Table 6.2. Population group: use of various sources (m) to access environmental information	80
Table 6.3. Population group: knowledge (m) about the environment	82

Table 6.4. Population group: seriousness (<i>m</i>) of environmental problems	82
Table 6.5. Age: use of various sources (<i>m</i>) to access environmental information	87
Table 6.6. Household income: use of various sources (<i>m</i>) to access environmental information	89
Table 6.7. Household income: knowledge (<i>m</i>) about the environment	90
Table 6.8. Household income: seriousness (<i>m</i>) of environmental problems	91
Table 6.9. Household income: seriousness (<i>m</i>) of climate change as an environmental problem	92
Table 6.10. Education: use of various sources (<i>m</i>) to access environmental information	92
Table 6.11. Education: knowledge (<i>m</i>) about the environment	94
Table 6.12. Education level: seriousness (<i>m</i>) of environmental problems	94
 Table 7.1. Results of the correlation analysis for significant predictor variables determining perceptions about environmental problems	 103
Table 7.2. Results of linear regression for factors predicting environmental perceptions	104
Table 7.3. Results of linear regression for factors predicting environmental perceptions about climate change	104
 Table 8.1. Clusters generated from five socio-demographic variables with item means (<i>t</i> values) and variance	 107
Table 8.2. Cluster influences on environmental problems (<i>m</i>)	108
Table 8.3. Cluster influences on information sources	109
Table 8.4. Cluster influences on environmental knowledge	109

List of abbreviations and acronyms

BPHS	British Panel Household Survey
BRC	The Broadcasting Research Council of South Africa
CREST	Centre for Research on Evaluation, Science and Technology
CSVr	The Centre for Study of Violence and Reconciliation
EK	environmental knowledge
EU	European Union
FET	Further Education and Training
GET	General Education and Training
GSS	General Social Survey
HOP	Health of the Planet Survey
ISSP	International Social Survey Programme
NEMA	National Environmental Management Act
NGO	non-governmental organization
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
RQ	research question
SAPA	South African Press Association
SASAS	South African Social Attitude Survey
SD	standard deviation
SES	socio-economic status
SPSS	Statistical Package for Social Sciences
Stats SA	Statistics South Africa
UK	United Kingdom
UNDP	United Nations Development Programme
UNESCO	The United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WVS	World Value Survey

Chapter 1: Introduction

“[The] ecological crisis is a crisis of maladaptive behaviour.” (Maloney & Ward, 1973:583)

Every day there are constant reminders about the consequences of not taking action to address environmental challenges (Willers, 1996). The public is confronting evidence of the harmful environmental impact of anthropological activities. Environmental degradation and hence environmental concern¹ have become important research areas (Newell & Green, 1997), as environmental concerns are among the most pressing issues of the modern era (Scalia, 2017). Environmental concern refers to a whole range of knowledge, perceptions, emotions, values, attitudes and behaviours related to the environment (Bamberg, 2003). The conceptualisation of environmental concern is of particular relevance, as it is of importance to know and understand the ways in which the public prioritise and categorise it (García-Mira, Real & Romay, 2005). These concerns are ever-growing due to increasing levels of pollution and other waste generation from human activities. This limits the capacity of the natural environment to accommodate the waste and therefore threatens human life (Ifegbesan & Rampedi, 2018).

Most of the current environmental problems of the world can be linked directly to human behaviour and perceptions² (Takahashi & Selfa, 2015; Tikka, Kuitunen & Tynys, 2000). Many scientists and local and provincial governments have implemented pro-environmental policies and management strategies that include social and natural considerations for conservation³ (Bennett *et al.*, 2017). However, successful environmental management cannot be accomplished without understanding the perceptions and attitudes of people toward environmental challenges and conservation (Abdulkarim, Yacob, Abdullah & Radam, 2017). Perceptions can be seen as useful evidence in all stages of environmental conservation planning, implementation and ongoing management (Bennett, 2016). “Only after understanding the relationships between the attitudes that people have toward the environment and the factors that influence these attitudes we will be able to comprehend and improve the public’s attitudes toward nature” (Tikka *et al.*, 2000, p:12). Perceptions about the environment provide insight and is essential for monitoring, evaluating and adapting environmental conservation and management programmes and policies (Bennett, 2016). Public perceptions of the environment need to become the main focus in the analysis of the relationship between people and the environment (Bi, Zhang, & Zhang, 2010). Understanding the interaction between human perceptions and the natural environment is important for developing and supporting effective policies for environmental management programmes (Bord, Fisher & O’Connor, 1998; Inglehart, 1995; Kangalawe, 2012; Maestre-Andrés, Calvet-Mir & Van den Bergh, 2016; Ren & Folta, 2016).

¹Environmental concern can be defined as an individual’s belief that humans endanger the natural environment, combined with a willingness to protect that environment (Franzen & Vogl, 2013).

² Perceptions about the environment and environmental changes can be used to describe negative or positive evaluation about the environment and is used by many researchers to study environmental management (Bennett, 2016). It “refers to the way an individual observes, understands, interprets, and evaluates” the natural environment and environmental changes (Bennett, 2016: 4).

³ Conservation of the natural environment can be defined as “the protection of plants and animals, natural areas, and interesting and important structures [...], especially from the damaging effects of human activity” (Cambridge Dictionaries, 2016).

Environmental concern and perceptions can be demonstrated by representational phenomena (beliefs and attitudes) and environmentally friendly activities (Raudsepp, 2001).

These perceptions are particularly interesting because, although they are more likely than actual degradation to influence behavior, they may be influenced by multiple factors in addition to actual degradation. In other words, particular groups of people may be more likely than others to report or perceive environmental degradation even though they experience the same environmental conditions (Barber, Biddlecom & Axinn, 2003:103)

Numerous studies have aimed to predict environmental perceptions and its determining factors. The research presented in this dissertation attempts to contribute to solutions of environmental problems by examining the public's environmental perceptions and its determinants of Stellenbosch, a town in the Western Cape, South Africa. Environmental change is a global man-made problem that many of the world's populations face, especially those living in developing nations, like South Africa.

1.1. Dissertation overview and structure

This dissertation is divided into nine chapters. In Chapter 1 the researcher provides a short introduction to the research. In Chapter 2 the researcher offers the problem statement and background information about the research. The researcher also discusses the potential value of the research, the supporting theory and the research questions that were addressed in the dissertation. Chapter 3 contains the literature review. The researcher provides a review of the literature on environmental communication (including environmental information sources and environmental knowledge), environmental perceptions, socio-demographic variables and segmentation studies. In Chapter 4 the researcher presents the research design and methods used during the research. The researcher discusses where the data collection took place, the research location, quantitative data collection and analysis, and qualitative data collection and analysis.

In Chapters 5 through to 8 the researcher presents and discusses results from the data collection and analysis in the following order:

- *Chapter 5:* The most important environmental issues facing SA, main environmental information sources used and general knowledge about the environment
- *Chapter 6:* The influence of socio-demographic variables on environmental perceptions, environmental information sources and environmental knowledge
- *Chapter 7:* The strongest factors influencing the public's perceptions of the environment
- *Chapter 8:* Stellenbosch publics and their differences in perceptions toward environmental challenges

In the last chapter, Chapter 9, the researcher concludes the dissertation by summarising findings, deliberating on limitations of the research and discussing opportunities for further research. This is followed by a list of all references used in the dissertation and an Addenda.

Chapter 2: Background, history, supporting theory and research questions

2.1. Problem statement

“Over the past three decades, protection of the natural environment has become not only a major social and political issue but also an important assignment in academic research” (Shen & Saijo, 2008:42). The human race faces a large variety of environmental problems that affect our ability to meet our most rudimentary human needs. Environmental degradation has largely been a by-product of organisations and technologies that meet human desires for the maintenance of family and tradition, personal security, enjoyment, comfort, power and status, and relief from labour (Stern, 2000). A lot of environmental problems are the result of human activity and even though individual anthropogenic impact on the natural environment⁴ is relatively small, collectively these effects on the natural environment can be enormous (Axelrod & Lehman, 1993; Kulözü, 2016).

It is becoming increasingly clear that to address these problems, human attitudes and behaviours need to change drastically (Carmi, 2013) and perceptions of an environmental problem can determine environmental behaviour (Barber *et al.*, 2003). Just as environmental quality is monitored, is it important to monitor people’s perceptions, values, and decision-making abilities about environmental degradation (Burger *et al.*, 2000). It has been suggested that monitoring environmental attitudes is equally as important as monitoring the actual environment for environmental assessments (Burger *et al.*, 2000). If human behaviour is to be changed, is important to know how these perceptions are formed. Therefore, people’s perceptions about the environment and environmental challenges are matters of public concern (Kaiser & Wilson, 2000) and were researched in the dissertation. Esengun *et al.* (2006:635) state: “Successful solutions to environmental problems can only be achieved by not only governmental intervention and enforceable regulations, but also through participation of the whole society.”

2.2 Research background

2.2.1 Global environmental concern

The environment in itself is an intricate construct; it can be local, and global, and can include various actors (Schaffrin, 2011). Therefore, the concepts of environmental perceptions and environmental concern must include these characteristics in order to address the full complexity of environmental problems any society may face (Schaffrin, 2011).

“The advancing degradation of natural resources caused by human activities has been the subject of discussion in contemporary societies [...] with the idea of environmental responsibility gaining ever-greater relevance” (Paço & Lavrador, 2017: 384). Along with the development of Western industry and the accelerated industrial processes during the 1960s, large parts of the natural environment was damaged or destroyed and many

⁴ Defined “as a community’s natural surroundings that contain natural resources” (Hunter *et al.*, 2010: 526); the relationship that humans and society have to natural systems and resources (Feindt & Oels, 2005), referring to a wide range of ecological circumstances (Anderson, 1991).

environmental problems and challenges appeared (Li, 2018). For decades there has been considerable evidence of global environmental degradation (Anderson, 1991; Bloom, 1995; Schaffrin, 2011).

The resulting physical changes to Earth are relatively well known, but the implications are generally not appreciated (Lubchenco, 1998). Rapid population growth and urbanisation, industrialisation, discharge of waste and unsustainable practices are some of the major causes of global environmental problems (Esengun, Sayili & Akca, 2006). Air pollution, noise pollution and poor solid waste management are frequently occurring examples of environmental problems in many urban areas, globally (Carvalho & Fidélis, 2009). Pollution, an international problem, is the main form of environmental degradation in developed countries (Chanda, 1996); while climate change, biodiversity loss, depletion of fish stocks and desertification are environmental problems of great urgency in developing countries (White & Hunter, 2009). Access to adequate food, clean water and energy, waste disposal and satisfactory sanitation are universal environmental problems, adversely affecting all developing nations (Inglehart, 1995; Kulözü, 2016). The causes and consequences of environmental degradation are not distributed evenly around the world. The impact on the lives of people in developing countries will be much greater than in developed countries (Dow, 1992).

Scientists are aware of global environmental problems, because environmental science documents the existing situation and makes predictions for future changes (Taylor & Buttel, 1992). Various studies of natural and social sciences have documented the effects of environmental change on fauna, flora, world trade, the global economy and international security (Taylor & Buttel, 1992). However, concern⁵ for the natural environment has been largely limited to developed nations in the Northern Hemisphere (Dunlap, 1994; Inglehart, 1995) and up until the 1990s little was known about the general public's perceptions about environmental issues (Dunlap, Gallup Jr & Gallup, 1993). The accumulation of scientific evidence has, as early as the 1980s, heightened public concern for environmental problems (Takala, 1991) and since the late 20th century, these concerns about the natural environment spread world-wide (Anderson, Romani, Phillips, Wentzel & Tlabela, 2007; Bloom, 1995; Dunlap, 1994; Gelissen, 2007; Jones & Dunlap, 1992; Kemmelmeier, Król & Kim, 2002; Marquart-Pyatt, 2015; Paço & Lavrador, 2017; Schlegelmilch & Diamantopoulos, 1996; Schultz & Zelezny, 1998). This increased concern is confirmed by a rise in international environmental agreements and non-governmental organisations (Struwig, 2010).

People in both developing and developed countries now perceive that the natural environment is deteriorating and they express concern for environmental quality (Adelle & Withana, 2008; Anderson, 1991; Brechin & Kempton, 1994; Diekmann & Franzen, 1999). The globalisation of this environmental concern has made expanding environmental perception research into international and non-Western contexts absolutely essential (Chen *et al.*, 2011).

⁵ Environmental concern can be viewed as how much people are aware of environmental problems and challenges, support efforts to solve or improve these problems, and the willingness to contribute to the solution (Hao, 2014).

Developing countries also struggle to manage and conserve protected areas (Guthiga, 2008). Therefore, solving environmental problems in developing countries is extremely important, as 85% of the population of the world live in developing countries (Kulözü, 2016). Over the years, environmental problems have become not just more in numbers, but also more complex (Dunlap & Jones, 2002) and, not surprisingly, these ever-increasing environmental problems have led many social scientists to focus on environmental concerns (Dunlap, 2017; Gökşen, Adaman & Zenginobuz, 2002).

According to Ruttan (1993) there have been three waves of concern for the environment since the 1940s (Table 2.1). This concern for and support of environmental issues has provoked the curiosity of academic researchers in 1970 (Samdahl & Robertson, 1989), resulting in an increase in public awareness⁶ of environmental issues since the 1980s (Running, Burke & Shipley, 2017). Local, national and international establishments now focus on environmental quality and perceptions (Alyaz, Öztürk & Genç, 2017).

Table 2.1. Three waves of concern regarding the environment (Ruttan, 1993)

Wave	General concern	Specific issues
First wave: 1940s and 1950s	Limited natural resources	Inadequate food production Exhaustion of non-renewable resources
Second wave: 1960s and 1970s	By-products of production and consumption	Pesticide and fertiliser use Waste disposal Noise Air and water pollution Radioactive and chemical pollution
Third wave: 1980s and 1990s	Global environmental change	Climate change Acid rain Ozone depletion

Source: Ruttan 1993

The importance of human perceptions for the management of environmental resources received global recognition as early as the 1960s when the environmental movement began (Anderson, Romani, Phillips, Wentzel & Tlabela, 2007; Chanda, 1996; Minton & Rose, 1997). Research articles on environmental concern

⁶ When individuals or the public have a greater sensitivity to the environment and environmental problems they increase their environmental awareness (Ito & Kawazoe, 2017).

and attitudes⁷ first appeared after the first Earth Day in 1970 (Guber, 1996) and since, over the past five decades, environmental sociologists and psychologists have attempted to describe, characterise and understand which variables influence an individual to exhibit concern for the natural environment (Cottrell & Graefe, 1997; Kaiser, 1998; Markowitz, Goldberg, Ashton & Lee, 2012). By the start of 1980, there were approximately 300 studies about *environmental concern* (Dunlap, 2017; Dunlap & Jones, 2002).

Consequently, the environment has emerged as social and political issues since the late 20th and early 21st centuries (Anderson *et al.*, 2007; Leach & Mearns, 1996; Marquart-Pyatt, 2007). Since then, scholars have recognised how important it is to determine how perceptions and knowledge influence human response to environmental degradation (Chen *et al.*, 2011). There is a growing recognition that science and technology alone cannot solve environmental problems and we need to consider that individual environmental perception and behaviour must be included as an essential part of the solution (Chan, 1998; Schahn & Holzer, 1990; Tikka *et al.*, 2000; Willers, 1996). Environmental sociology aims to answer the questions of how differences in perceptions of the environment and concern for the environment can be explained (Gelissen, 2007).

The concept of how the public perceives the environment is complex (Cantrill, 1998). However, since the interest in environmental problems increased, governments world-wide have expanded on their efforts to raise awareness and to understand these perceptions (Anderson *et al.*, 2007). Surveys of public perceptions and understanding of environmental problems indicate that the public does not fully understand environmental problems (Stamm, Clark & Eblacas, 2000). The public's understanding of environmental problems is seen as a prerequisite to respond and adapt to the ever-changing environment (Anderson *et al.*, 2007; Bakuwa, 2015).

Individual perceptions can, and should, influence environmental policies on both national and international levels (Bi, Zhang & Zhang, 2010; Löfstedt, 1995). Public participation provides a voice to societies and communities and adds legitimacy to the decision-making process concerning environmental issues (Fakier, Stephens, Tholin & Kapelus, 2005). Efforts to protect and improve the environment will only be successful if, when making decisions, the public and policy-makers consider both the environment and the public's experiences with and opinions of environmental degradation (Armah, Yengoh, Luginaah, Chuenpagdee, Hambati & Campbell, 2015; Kemmelmeier *et al.*, 2002).

2.2.2 Global environmental perceptions

There are examples where policymakers have made the mistake not to include perception studies into environmental education, communication and management efforts. From 1990 to 1994, the United Kingdom's (UK) Department of Environment spent more than £6 million to increase the public's awareness about climate change and energy conservation, primarily through newspaper and television advertisements (Löfstedt, 1995). However, the campaign failed. Awareness of climate change did not increase and people were not more willing than before to save energy (Löfstedt 1995). The campaign design excluded previous findings on climate change

⁷ Attitudes is an evaluative tendency held by a individual which is used to assess a variety of things, issues and /or people ;environmental attitudes describes an individual in relation to environmental issues (Liefländer & Bogner, 2018).

perceptions, resulting in the campaign costing the tax payers a lot of money. The campaign failed to address the issue of the public's confusion between global warming and ozone depletion. Environmental campaigns and policies need public acceptance to be effectively implemented and should therefore be in line with the public's perceptions of environmental change (Adelle & Withana, 2008; Rajapaksa, Islam & Managi, 2018).

"Man's perception of the environment is considered so fundamental that it becomes the main point of departure for any analysis of man-environment relations" (Whyte 1977:11). The study of perceptions is a basis for understanding attitudes which may lead to certain behaviours (Bamberg, 2003; Fishbein & Ajzen, 2010; Hungerford & Volk, 1990; Kaiser & Wilson, 2000; Minton & Rose, 1997). Tuan (1974) identifies perceptions as a response to external stimuli, in research regarding the environment, in which an individual registers an opinion and assesses it. Attitudes then develop and can be defined as a cultural stance toward a situation or process (Tuan, 1974).

It has been stated that perceptions of an environmental problem are likely, more so than the actual problem, to have an impact on environmental behaviour (Barber *et al.*, 2003). Concern for the environment has a strong impact on environmentally friendly behaviour, such as recycling and buying environmentally friendly products (Axelrod & Lehman, 1993; Bamberg, 2003). Perceptions of environmental change are meaningful and therefore useful to help individuals respond and adapt to environmental degradation (Armah *et al.*, 2015; Axelrod & Lehman, 1993). Research on the perceptions of environmental problems should be seen as an attempt to bridge the gap between environmental scientists, policymakers and the public (Bakuwa, 2015).

The research on environmental perceptions can be divided into two fields. Firstly psychological factors related to perceptions about the environment, and secondly, socio-demographic factors linked to environmental perceptions and behaviours (Alibeli & White, 2011; Casey & Scott, 2006; Dietz, Stern & Guagnano, 1998; Oreg & Katz-Gerro, 2006). In this dissertation the researcher focused on the latter. The reasons for this focus will become clear in the following section.

2.2.3 Environmental perceptions, socio-demographic variables, environmental knowledge and the media

In the literature about environmental perception, the role of socio-demographic criteria is perceived as highly relevant and has led researchers to pay much attention to the link between demographic behaviour and environmental consequences (Clements, 2012; Ifegbesan & Rampedi, 2018; Pebley, 1998). During the 1960s, researchers began to look at the relationship between humans and the natural environment (Kollmuss & Agyeman, 2002). This led to the discovery of the importance of public perceptions for the management of the environment (Burger *et al.*, 2000; Chanda, 1996; Stefanescu & Baltatescu, 2013; Whyte, 1977). Regular assessments of public attitudes toward environmental concerns started during the 1970s (Bord *et al.*, 1998).

However, there has not been a homogenous global increase in environmental concern, but rather clearly distinct perceptions and concerns in differently constructed social locations and situations (Hunter, Strife & Twine, 2010; Marquart-Pyatt, 2015). Individuals vary greatly in their level of environmental concern (Arnocky,

Stroink & DeCicco, 2007; Franzen & Meyer, 2010). Some people are more likely than others to make personal sacrifices to protect and sustain the environment (Arnocky *et al.*, 2007). Therefore, a need exists to understand the implications of human perceptions to influence the management of environmental challenges through policies (Bardsley & Edwards-Jones, 2007).

The increased interest in environmental concerns has led both governments and society to increase efforts to improve the public's understanding of environmental degradation (Anderson *et al.*, 2007). There is now an expectation that the heightened understanding of environmental pollution and degradation will lead to better stewardship of the environment – by individuals and communities alike (Anderson *et al.*, 2007; Bardsley & Edwards-Jones, 2007)

Not one person experiences the environment as one whole object, but only distinct aspects of the environment (Dunlap & Jones, 2002; Heberlein, 1981). Individuals make decisions about which aspects of the environment are important and valuable and what pro-environmental behaviour to adopt to protect or improve the environment (Burningham & O'Brien, 1994).

There is also not only one way to interpret environmental problems, but rather a variety of interpretations. Indicators of environmental concern need to measure the intricacy of the issue (Kanagy & Nelsen, 1995). Academics have struggled to determine the reason for environmental perception, partly because many studies exclude many variables (Guth, Green, Kellstedt, Smidt & Guth, 1995). Two people could express the same level of environmental concern for different reasons (Schultz, 2000). People are also intricate beings that differ greatly from another, resulting in differences in concern for the environment (Gifford & Nilsson, 2014; Schultz & Zelezny, 1999).

Early research in the field of environmental perceptions focused on socio-demographic characteristics of individuals; how people respond to questions regarding the environment partly depends on who they are (Hamilton & Duncan, 2010; Samdahl & Robertson, 1989). Demographic variables and social relations of populations in a specific area may influence the environmental perceptions of the population segment (Dow, 1992). Demographic characteristics of a population have both positive and negative effects on perceptions of the environment and natural resources (Haq & Ahmed, 2017).

Socio-demographic factors such as age, gender, race, religion, culture, place of residence, income (socio-economic status), education level, and occupation are variables influencing specific perceptions of environmental challenges (Bakuwa, 2015; Barber *et al.*, 2003; Barr, 2003; Dietz *et al.*, 1998; Dow, 1992; Hamilton & Duncan, 2010; Haq & Ahmed, 2017; Maestre-Andrés *et al.*, 2016; Samdahl & Robertson, 1989; Van Liere & Dunlap, 1980). The most consistent findings indicate that people in support of the environment are younger and more educated (Xiao & McCright, 2007). This is further discussed in the literature review.

Another important factor influencing environmental perceptions is the media as it is also viewed as a powerful tool for influencing public opinion (Ladle, Jepson & Whittaker, 2005). Perceptions about environmental change are popularised in the news and media and helps to build support among the public for environmental

management and improvement projects (Leach & Mearns, 1996) Undoubtedly, most of what people hear about environmental problems comes from the media, since our personal knowledge about the state of the environment is likely to be highly selective (Shanahan, Morgan & Stenbjerre, 1997). The media refers to a range of mediums, from television, to the Internet, to radio. Within one medium there are different ways in which the environment can be presented (Davies, 2008).

Media representations of environmental problems influence public perceptions and understanding (Hansen, 1991) and may contribute to deeply-held beliefs about the state of the environment (Shanahan *et al.*, 1997). The media plays a key part in generating *the environment* as a public concern (Hansen, 2011). Studies indicate to the relationships between media coverage of environmental issues and trends in environmental concern, as measured through public opinion surveys (Hansen, 2011).

Media coverage of environmental matters seems to follow two trends (Carlson, 2004). First, there is the sensational news coverage emphasising events with negative environmental impacts, which are reported on due to their high audience appeal. Secondly there is the documentary type of article or programme which deals with both negative and positive themes, for example, the destruction of rain forests in South America and preservation of endangered species (Carlson, 2004). Both types of media coverage can inform viewers/readers about the importance of environmental issues.

A person is unlikely to be concerned about the environment and act in an environmentally friendly way if the person knows nothing about the problem (Gifford & Nilsson, 2014; Ito & Kawazoe, 2017). Conventional wisdom suggests that people with more knowledge about the environment will have more positive attitudes towards the environment (DeChano, 2006). It can be assumed that environmental knowledge⁸ is an important factor to determine environmental attitudes (DeChano, 2006; Kangalawe, 2012) as well as a precondition for a person's environmental behaviour (Frick, Kaiser & Wilson, 2004).

Knowledge is generally referred to as being know-how, having information with judgement or the capacity for effective action. [...] EK [environmental knowledge] may be defined as the familiarity, awareness, and understanding of the biophysical environment and the related environmental issues, along with the methods to achieve a better environment. (Cheung *et al.*, 2015:2).

2.2.4 Environmental communication

People are subjected to rely on communication networks to describe and explain what they cannot see, i.e. environmental change (Kassing, Johnson, Kloeber & Wentzel, 2010). The rise of the environment as a problem of public concern during the 1960s (Chen *et al.*, 2011; Hansen, 1991), has subsequently lead to the environment as a socio-political issue in the 1970s and the communication of environmental challenges and solutions as a specialty subject has been gradually emerging since the 1960s (Pleasant, Good, Shanahan & Cohen, 2002).

⁸ Environmental knowledge can be defined as “a general knowledge of facts, concepts and relationships concerning the natural environment and its major ecosystems” (Fryxell & Lo, 2003). It is also a term used to describe knowledge and awariness about environmental problems and possible solutions to the problems (Zsóka *et al.*, 2013).

The year 1996 marked a peak in the in the development of environmental communication⁹, a trend which reflects increasing social and cultural interest in environmental problems and challenges (Condit & Depoe, 1997).

Environmental communication can be defined as “any kind of environmentally relevant information flow which involves both communicators and audiences and is achieved through coding, effective message delivery and interactive listening” (Pillmann, 2002:2). Environmental communication is also the “talk or the transmission of information about the wide universe of environmental topics – whether it’s global warming or grizzly bear habitat – our definitions will be as varied as the topics for discussion”(Cox, 2013:18).

Environmental communication is an important part of the process to accelerate social change in relation to environmental challenges (Brulle, 2010). One of the key goals of environmental communication is to help humans understand and appreciate the natural world better (Arendt & Matthes, 2016; Jarreau, Altinay & Reynolds, 2015). It is used to promote positive environmental attitudes and environmental behaviours (Li, 2018). Environmental challenges and problems can be addressed through communication and education campaigns (Chan, 1998), thus influencing the public’s perception of environmental issues (Stamm *et al.*, 2000).

The key to developing effective operative communication strategies is to understand the meanings and values the public assigns to their natural environment (Cantrill, 1998). Hence, environmental education and communication should be the process of informing the public and allowing them to respond with questions and concerns. The public should contribute to the policy-making process regarding environmental threats and problems (Brulle, 2010) as the public’s individual choices influence consumer and corporate behaviour (Fakier *et al.*, 2005).

Community participation in environmental conservation practices is very important to assure access and control over natural resources (Kangalawe, 2012). There is now practically unanimous consent that continued progress to solving environmental problems is possible only through active community participation (Dasgupta, Laplante & Meisner, 2000). Community involvement ensures more commitment in ensuring sustainable management of environmental resources and areas (Kangalawe, 2012). Environmental communication should effectively get the public to think about environmental problems and how it relates to their everyday lives (Besley, 2015).

Studying environmental communication can identify weak links in the communication process that might need attention in reducing environmental degradation (Halford & Sheehan, 1991). The public’s experiences of the environment should be considered a key factor when developing communication strategies and then ultimately

⁹ The field of environmental communication examines the “link between communication practices and environmental affairs” (Pleasant *et al.*, 2002). It focuses on how people communicate about the natural world and environmental issues (Jarreau *et al.*, 2015). “Environmental communication as a field of study examines the public’s perceptions of the world and how these perceptions shape human–environment relations” (Jarreau *et al.*, 2015, p. 144).

policies. The public's experiences influence the way the public perceives the environment and how they view communication about that environment (Cantrill, 1998; Fakier *et al.*, 2005; Rademakers, 2004).

2.3 A brief history of South Africa's environmental challenges

South Africa [has] been fortunate to inherit a natural environment which is rich and varied in its scenic beauty and possesses a remarkable variety of fauna and flora. Much more than material possessions, it is the environment in which we live which determines the quality of our lives. By just so much as we degrade the environment, so do we degrade our own lives. By so much as we cherish and preserve it, so do we enrich them. (Sullivan & Sullivan, 1977:6)

Globally, environmental degradation constitutes one of the most significant challenges of modern times (Adams & Adeleke, 2016). This threat of negative environmental change in Africa has been on the agenda of the scientific community since the 1970s (Klintenberg, Seely & Christiansson, 2007), and South Africa is no exception.

South Africa is a country with a mix of developed and developing country populations (Carlson, 2004), but is predominantly seen as a middle-income developing country (Kok, Collinson, Van Tonder, Roux, & Carenne, 2006). The country faces social challenges such as a lack of housing, basic facilities and domestic waste disposal and a low level of education and literacy. Rapid urbanisation also directly affect roughly 55% of the population and indirectly the remainder of the population (Carlson, 2004; Willers, 1996).

South Africa has a total population of 54 million residents of which 41.44% is in the age group of between 25 and 54 years old and the median age is 56.8 years (Indexmundi, 2016). The population of South Africa is divided into 49% males and 51% females (Stats SA, 2016). The population consists of various population groups: African 80.2%, white 8.4%, coloured 8.8% and Indian/Asian 2.5%, with the main languages spoken being IsiZulu (22.7%), IsiXhosa (16%), Afrikaans (16%) and English (9.6%) (Indexmundi, 2016). The South African population has also changed from predominantly rural to an increasingly urban population, with more than 50% of the population now living in urban areas (Kok, Collinson, Van Tonder, Roux & Carenne, 2006; Willers, 1996). Of the total population, 64.8% live in urban areas. The largest cities are Johannesburg (9.339 million citizens), Cape Town (3.66 million citizens) and Durban (2.901 million citizens), in order (Indexmundi, 2016). Many of the more recent urban dwellers live in "informal settlements," around larger cities, with few municipal services (Ballantyne & Oelofse, 1999; Carlson, 2004; Zeelie, 2003). South Africa's population can be divided into two distinct, culturally-diverse societies. The larger part of the population, that live in circumstances similar to those of a developing country and the other, which comprise mostly of the white, coloured, Asian and Indian community. This part of the population enjoys conditions similar to those of a developed country (Anderson *et al.*, 2007). However, the majority of South Africa's population remains poor and not adequately educated (Willers, 1996), living in informal settlements, where environmental destruction is very clear (Zeelie, 2003).

In culturally diverse, democratic societies, such as South Africa, the management of the environment should depend on effectively measuring public concern for environmental challenges (Beardmore, 2015). Environmental sustainability is an issue of great importance in South Africa and not a lot of research has been done locally. Urbanisation, the environment and public engagement are important issues when planning for the future of South Africa (Rousseau & Venter, 2001).

Local environmental concerns revolve around socio-economics, livelihoods and an individual's experience (Hunter *et al.*, 2010). Rapid urbanisation, overpopulation and economic growth makes the preservation of the natural environment difficult (Holl, Daily & Ehrlich, 1995) and improving living conditions may result in environmental degradation (Barber *et al.*, 2003).

Residents in a developing country, such as South Africa, experience environmental problems differently than those of already developed countries. For example, citizens in a developed nation experience the environment as “dolphins or whales, nuclear and toxic wastes, ozone layer depletion, acid rain, recycled tin cans or newspapers” (Esengun *et al.*, 2006:1). Residents living in a developing country, however, experiences environmental challenges differently, with problems regarding: “drinking and irrigation water, [...] soil, wild and domestic animals [...]” (Esengun *et al.*, 2006:1).

Some other areas of environmental concern which warrant attention in South Africa include “desertification, soil erosion, pollution of air and water, acid rain, overpopulation, domestic and industrial waste disposal, the use of natural resources, and the conservation of flora and fauna” (Carlson, 2004, p. 6). Historically, not enough importance has been placed on environmental issues (Carlson, 2004). Rapid population growth and urbanisation in South Africa has resulted in many socio-economic and environmental problems (Rousseau & Venter, 2001).

South Africa is rich in biodiversity, providing for seven major terrestrial biomes (Carlson, 2004; Sullivan & Sullivan, 1977; Turpie, 2003). South Africa also host some of the world's best-preserved nature reserves in the world and these have become major tourist attractions (De Beer & Marais, 2005). However, during the apartheid era, environmental protection was enforced by strict policies, fences and border patrols (Cock & Fig, 2001; De Beer & Marais, 2005; Struwig, 2010). The natural environment was protected in official conservation areas (De Beer & Marais, 2005). These areas were developed at the cost of many local communities, leading to the removal and exclusion of these communities from management and policies (Picard, 2003; Struwig, 2010). Poverty is also seen as a cause of environmental degradation (Cock & Fig, 2001). During this period, only white citizens were party to environmental protection areas and a large part of the African population was left out from decision-making processes (Cock & Fig, 2001; Struwig, 2010). Due to this, a large portion of South Africans believe that environmental issues are “white, middle class” issues (Cock & Fig, 2001; Struwig, 2010:200).

Since the end of apartheid, nature conservation has changed to a more natural resource management approach. However, the post-apartheid South African government has not been fully successful in engaging with poor,

disadvantaged or rural communities (Cock & Fig, 2001; Fakier *et al.*, 2005). Environmental degradation often disproportionately affects rural communities where most livelihoods are dependent on natural resources and environmental sustainability (Adams & Adeleke, 2016). Occupants of informal settlements (a common occurrence in South Africa) live close to the environment and therefore it is critical that constraints on the environment are kept at a minimum to reduce the vulnerability of these settlements (Ballantyne & Oelofse, 1999). Addressing the needs of historically disadvantaged populations will include addressing the needs that directly affect the environment (Anderson *et al.*, 2007).

The new post-apartheid democracy includes public input in sustainable development to allow all South African citizens to be part of the environment (Struwig, 2010). The focus of the post-apartheid Constitution of South Africa (passed in 1996) is a set of human rights, including, among others, that of a healthy environment that should be protected. Pollution and ecological degradation should be prevented and ecologically sustainable development secured (see Republic of South Africa, 1996; Constitution of South Africa, Chap. 2. Sec. 24). Their placement in the constitution means that environmental concerns are given a greater importance than might otherwise be the case and may lead to a greater awareness of environmental challenges (Anderson *et al.*, 2007; Anderson *et al.*, 2010). It also allows policies to redress social and economic injustices associated with environmental conservation and management (Picard, 2003).

The Constitution of South Africa mandates the government to take reasonable legislative measures that promote conservation by providing for the management and conservation of biological diversity and the sustainable use of indigenous biological resources. Section 24 of the Constitution provides the overarching legislative foundation for environmental management in South Africa. (Duncker & Gonçalves 2017:172)

The National Environmental Management Act¹⁰ (NEMA), that took effect in 1999, declares that it will “provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; and to provide for matters connected therewith” (Government Gazette, 1998:2). The post-apartheid public of South Africa also expects the government to provide water and sanitation, which is directly linked to environmental quality (Anderson *et al.*, 2007). Environmentalism in South Africa now attempts to include access to basic resources such as water, land and the participation of communities in environmental decision-making processes (Cock & Fig, 2001).

Different population groups will perceive environmental problems differently (Science Communication Unit, 2014). The specific conditions of a household could be related to the perceptions toward environmental problems. When South African citizens were asked during a survey to either *agree* or *disagree* (they also had the option of stating *uncertain*) with the following statement: “There are more important things to do in life than to protect the environment,” 32.2% of the population agreed with the statement, 18.2% were uncertain and 45.4% disagreed (Struwig, 2010:204).

¹⁰ NEMA encompasses all environmental acts in South Africa from 1999 onwards.

Research in South Africa indicates that occupants of informal settlements understand environmental quality in terms of the natural environment, services and facilities it provides, personal and community safety, and employment opportunities (Ballantyne & Oelofse, 1999). Similar results come from the 2004 *General Household Survey* (Anderson *et al.*, 2007). The black African community perceive water pollution as more of a problem in comparison to non-African (white, Indian, coloured) households. This is not surprising, given the poor conditions under which many black African households live (Anderson *et al.*, 2007). This also suggests that people who live in worse environmental conditions are more likely to perceive environmental issues as bad (Anderson *et al.*, 2007). However, qualitative research have also shown that members from the black African community have negative perceptions of the environment, due to a lack of interest (Ballantyne & Oelofse, 1999).

Environmental sustainability is an issue of importance and concern in South Africa, mainly due to the nature of past development practices (Rousseau & Venter, 2001). The challenge for the South African society is to implement strategies that are aimed at positive economic, political and social growth and which can promote environmental conservation and sustainability at the same time (Carlson, 2004). It is also important to ensure that proposed solutions to the environmental problems of South Africa are practical and appropriate to the context of this country (Carlson, 2004).

Although a lot has changed since apartheid, and the government is environmentally-minded, there are still doubts about how much importance South Africans place on the environment and environmental issues (Zeelie, 2003). Acknowledging these historical factors, and the differences between South Africa and other third world countries, in their political make-up and views on social problems, makes South Africa a worthwhile and necessary location to study individuals' awareness and perceptions of regarding environmental degradation and problems (Anderson *et al.*, 2007). This relates to the historical reshaping of South Africa's political, economic and social systems (Anderson, Wentzel, Romani & Phillips, 2010) and its richness in biodiversity.

In this dissertation this researcher sought to identify the perceptions and understanding of environmental issues among the population of a region in a developing country, the Western Cape of South Africa. It relies on the conceptual model (still to be discussed) originating from environmental behaviour literature and intends to explore the effect of socio-demographic variables, sources of environmental news and information, and environmental knowledge on the development and formation of environmental perceptions (Frick *et al.*, 2004; Gelissen, 2007; Hunter *et al.*, 2010).

2.4 Potential value of the research

One of the major tasks facing environmental psychologists today is to determine the public's response to the environmental crises which face us – how much do they know, what are their attitudes, what commitments are they making, what commitments are they willing to make. (Arbuthnot & Linng 1975:275)

Views about environmental change in Africa, including South Africa, are not restricted to professionals. Changes in the natural environment are not only recorded by research and technology, but also perceived by

individual people (Roeschel, Graef, Dietrich & Schaefer, 2016). As environmental protection and sustainability are dependent on people's choices and actions, research targeted at the individual is deemed important (Arendt & Matthes, 2016). Studies of public opinion on environmental problems have been used in research in many nations around the world (Dunlap, 2017).

Few studies have focused on the determinants of environmental perceptions and behaviour in Africa (Ifegbesan & Rampedi, 2018). Historically, research into environmental issues in South Africa focused on problems of a developed country and not that of a developing country (Ballantyne & Oelofse, 1999). Previous research done by Anderson *et al.* (2010) on the environmental consciousness of South Africans only examines four environmental problems (water pollution, air pollution, land degradation and littering). The analysed data is that of the 2004 *General Household Survey* conducted by Stats SA (Anderson *et al.*, 2010). The data are purely quantitative and the sample was not truly representative of the South African demography in terms of population groups (grouping the coloured and white population together) and economic status (it does not include household income) (Anderson *et al.*, 2007). “[Research is] focussing on what people think about environmental problems without probing into why they think it or how deeply they are committed” (Inglehart, 1995:57).

Other research in the field of environmental perceptions only focus on the environmental perceptions of previously disadvantaged areas in South Africa (Ballantyne & Oelofse, 1999) or only on one kind of environmental problem, e.g. climate change (Anderson *et al.*, 2007; White & Hunter, 2009). This is an issue of concern as more affluent members of the South African society also influence environmental degradation (Ballantyne & Oelofse, 1999).

According to Barber *et al.* (2003), measuring perceptions of environmental problems is important for the following three reasons:

1. perceptions of the environment and environmental problems may serve as an indicator of actual environmental degradation when objective data are not available;
2. perceptions influence the initial participation in activities intended to conserve and improve the environment; and
3. perceptions of environmental problems may influence an individual's environmental behaviour.

The role of environmental perception research in human-nature relations can be described in five goals (Whyte, 1977:14):

1. “... contributing to the more rational use of biosphere resources by harmonising local (inside) knowledge and that available from outside;
2. increasing understanding on all sides of the rational bases for different perceptions of the environment;
3. encouraging local involvement in development and planning as the basis for more effective implementation of more appropriate change;

4. helping to preserve or record the rich environmental perceptions and systems of knowledge that are rapidly being lost in many rural areas;
5. acting as an educational tool and agent of change as well as providing a training opportunity for those involved in the research.”

As stated before, measuring local perceptions of the environment is necessary to the success of conservation policies and environmental management (Jacobson & McDuff, 2017). It can also help to determine the underlying reasons for the lack of support for the environment and identify relevant interventions to ensure long-term support for the environment and environmental conservation initiatives (Bennett, 2016). No environmental policy, legislation or management strategy can be successful without public support (Haron, Paim & Yahaya, 2005).

Drawn from that, this is, to the researcher’s knowledge, the first mixed-method study investigating socio-demographic and environmental communication variables that influence the public’s perceptions and knowledge of environmental change and environmental problems (in a developing country) in the Western Cape; expanding on previous research in South Africa (Ballantyne & Oelofse, 1999; Carlson, 2004; Hunter *et al.*, 2010; Infield, 1988; Mbewe, 2016). It does not only consider the perceptions of individuals, but also the reasons as to why they perceive the environment and environmental problems as they do (Casey & Scott, 2006).

This dissertation compares different socio-demographic factors with environmental perceptions and the use of different sources to access environmental information. Few studies have researched media sources and public perceptions of environmental problems in poor and developing countries (Thaker, Zhao & Leiserowitz, 2017). The mixed-method approach to the data collection of the study allows for an in-depth analysis of the public’s perception toward the environment (Bloom, 1995). Carefully designed public surveys can reflect public perceptions and concerns, especially among different social groups, and in turn also influence policy makers (Bloom, 1995).

This information is critical for identifying and developing programmes to address and manage environmental problems in South Africa (Bord *et al.*, 1998; White & Hunter, 2009). Regarding South African environmental perceptions and management: “If conservation management outside protected areas is to be approached with the same rigour as management inside protected areas, then the attitudes [...] towards conservation [...] must be studied and their perceived needs and aspirations taken into account” (Infield 1988:22). Therefore, unless a public understands environmental issues, they will not participate in decision-making processes (Macnaghten & Jacobs, 1997). Worldwide there are calls to increase community engagement in the decision-making process involving environmental issues (Besley, 2015). Policy makers need to know what the public understands and what they want, to insure policies that will be supported and tolerated (Bord *et al.*, 1998), whilst acknowledging the diversity amongst all stakeholders (Beardmore, 2015). Research show that the public perceive environmental problems are scarce and more research is needed (Besley & Shanahan, 2004). This dissertation

therefore fills a gap in the understanding of how the local population perceives and understands environmental problems.

2.5 Supporting theory and conceptual framework

The complexity of environmental problems, with their intricate connection to the material, cultural, social, economic, political aspects of our lives, invites scholars to bring diverse conceptual, theoretical, and methodological frameworks to the task of understanding and mitigating these expansive concerns. The more perspectives, the more dynamic our understanding of these problems and the greater options available. (Peeples 2015:39)

Building on previous models and research, the assumption is that environmental communication in the media and other environmental information sources (Besley, 2008; Cheung *et al.*, 2015; Huang, 2016; Kassing *et al.*, 2010; Nisbet, Scheufele, Shanahan, Moy, Brossard & Lewenstein, 2002; Stamm *et al.*, 2000; Willers, 1996), socio-demographic variables (Bi *et al.*, 2010; Cottrell, 2003; Diekmann & Preisendörfer, 1998; Ito & Kawazoe, 2017; Liu, Vedlitz & Shi, 2014; Samdahl & Robertson, 1989; Stern, Kalof, Dietz & Guagnano, 1995; Tindall, Davies & Mauboulès, 2017), and knowledge about the environment (Cheung *et al.*, 2015; Diekmann & Preisendörfer, 1998; Haron *et al.*, 2005; Ito & Kawazoe, 2017; Malka, Krosnick & Langer, 2009; Park & Yoon, 2017; Zsóka, Szerényi, Széchy & Kocsis, 2013) contribute to people's perception about the environment (Table 2.2 and Figure 2.1). Policies should be formed with perceptions and communication sources in mind, with the aim to create environmentally conscious citizens.

Both the cause of environmental problems and possibilities for addressing them depend on human perceptions, attitudes and behaviour, which are linked to values, preferences and beliefs about the world. Communication is key to analysing the relation between all of these aspects. This thematic issue reports on research which provides insights into how we can communicate environmental issues effectively. (Carvalho, 2009:1)

Table 2.2. Literature supporting the environmental perceptions conceptual framework

Literature	Influence on model
Information sources	
Besley, 2008	Media exposure (particularly) influence environmental values, promoting environmental concern
Cheung <i>et al.</i> , 2015	Television and newspapers are popular mediums to gain access to environmental information
Kassing <i>et al.</i> , 2010	There is a positive relationship between practising environmental communication and acting in an environmentally friendly way

Nisbet <i>et al.</i> , 2002	Different media (newspapers, television and science magazines) influence perceptions about science (the environment)
Huang, 2016	Individuals use television, newspapers and online sources to access information about science
Willers 1996	Exposure to mass media may influence environmental attitudes
Stamm <i>et al.</i> , 2000	Media use makes a difference in understanding environmental issues
Socio-demographic variables	
Liu <i>et al.</i> , 2014	Certain socio-demographic factors influence environmental concern: gender, race and age
Diekmann & Preseindörfer, 1998	Socio-demographic variables of an individual influence environmental consciousness: age and gender
Bi <i>et al.</i> , 2010	Socio-economic characteristics affect environmental perceptions: age, gender, education and income
Cottrell, 2003	Responsible environmental behaviour is influenced by certain socio-demographic variables: income, age and education
Samdahl & Robertson, 1989	Socio-demographics influence the public's perceptions of environmental problems: education, income and age
Stern <i>et al.</i> , 1995	There is a relationship between gender and environmental concern
(Tindall <i>et al.</i> , 2017)	Socio-economic and socio-demographic variables influence pro-environmental values: gender, age, income and education
(Ito & Kawazoe, 2017)Ito & Kawazoe, 2017	Socio-demographic factors are associated with environmental awareness: education and income
Environmental knowledge	
Cheung <i>et al.</i> , 2015	Younger individuals have more environmental knowledge than their older counterparts
Diekmann & Preseindörfer, 1998	Ecological knowledge influences environmental consciousness

Haron <i>et al.</i> , 2005	Knowledge correlates positively with environmental attitudes and behaviours
Ito & Kawazoe, 2017	Environmental knowledge is seen as a prerequisite for environmental attitudes
Malka <i>et al.</i> , 2009	Increased environmental knowledge is associated with increased environmental concern
Park & Yoon, 2017	Environmental knowledge determines an individual's environmental behaviour
Zsóka <i>et al.</i> , 2013	An increase in environmental knowledge leads to positive changes in environmental behaviour

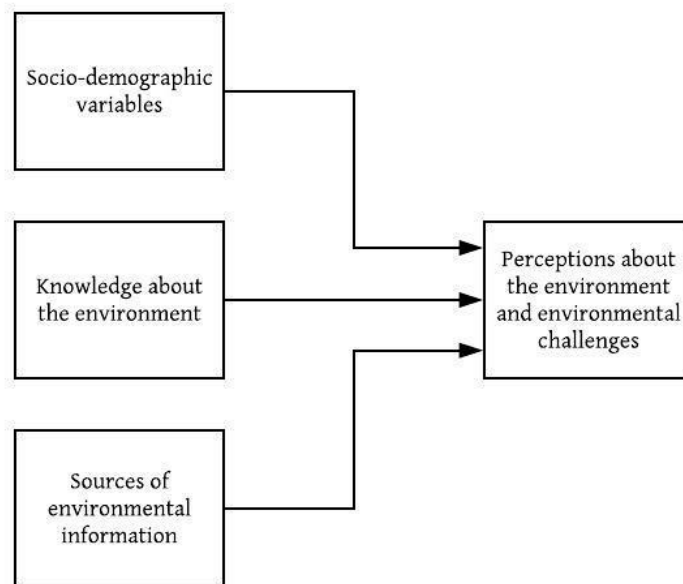


Figure 2.1. Basic conceptual framework

2.5.1 Environmental communication framework

Environmental communication is the planned and strategic use of communication processes and media products to support effective policy making, public participation and project implementation geared towards environmental sustainability. It is a two-way social interaction process enabling the people concerned to understand key environmental factors and their interdependencies and to respond to problems in a competent way. (OECD, 1999:5)

Environmental communication has become an increasingly established field of study since the 1990s (Anderson, 2015). As concerns about environmental issues increase, journalists and governmental officials need to know how the public receives and also want to receive information about the environment (Lacy, Riffe & Varouhakis, 2007). It is increasingly being recognised that community engagement is crucial, particularly on controversial issues such as climate change, in the environmental sciences (Kearns, 2012). In this regard it is clear that there is a need for communication; to make people conscious of their impact on the environment (Alyaz *et al.*, 2017). Since the early 1990s, the United Kingdom (UK) has emphasised the significance of actively involving citizens in debates about environmental issues; providing them with the information and then allowing for citizen participation (Barr, 2003). What the public knows and understands about the environment differs widely from that of experts (OECD, 1999) and is mainly the result of media representations about the environment (García-Mira *et al.*, 2005).

Public environmental perceptions may be influenced by various media content and channels (Nisbet *et al.*, 2002) and the media plays an important role as an information source (Figure 2.1) (Park, 2013). The idea behind getting people to support a policy or changing their behaviour will be the same whether we study

environmental issues or another issue (Besley, 2015). Therefore, it is useful to think of environmental communication as part of the larger field of science communication (Besley, 2015).

Science communication is often represented as a fairly passive and unidirectional process of translation and education and distinguished from public engagement or public participation in science, which are idealized as more active and interactive processes in which non-scientists collaborate in the conduct of science with possibilities for deep coproduction of ecological knowledge based on multiple ways of knowing the environment. (Burke, Welcj,-Devine, Gustafson, Heynen, Rice, Gragson, Evans & Nelson, 2015:4)

The way an environmental problem is articulated will affect the process of how the problem is handled by the public (Feindt & Oels, 2005). An informed public is more likely to be alert to environmental problems and more inclined to challenge the government and other policymakers on environmental issues than an uninformed public (Adelle & Withana, 2008; Fakier *et al.*, 2005) (Fakier *et al.* 2005; Adelle and Withana 2008).

This *deficit model* of science communication, dominating the way science was communicated for a long period of time (Carvalho, 2007), argues that behaviour toward the natural environment can be altered by providing the right information through communication efforts (Jefferson, Bailey, Laffoley, Richards & Attrill, 2014). This model is presented like this:

COVERAGE → UNDERSTANDING → ACTION (Stamm *et al.*, 2000)

However, there is a problem with linear models of communication: “[...] in their pursuit of linearity, they gloss over the interactive nature of meaning construction among and between institutions in society” (Hansen, 1991:447). These models also assume that gaps in scientific public knowledge are vital in driving societal conflict over science, when, in reality, science literacy only plays a minor role in forming public perceptions and decisions (Nisbet & Scheufele, 2009). This argues that the behaviour an individual show toward the environment is dependent on more than just a linear process of providing the right information that may lead a change in to behaviour. Individuals may rely on their own senses, social standing and experiences to construct perceptions about environmental problems (Barr, 2003; Cottrell & Graefe, 1997; Groffman *et al.*, 2010; Kuchinskaya, 2018; Paço & Lavrador, 2017; Stamm *et al.*, 2000). This is usually the case with environmental education, public participation and environmental politics (Pillmann, 2002).

During the 1990s, research on environmental communication noted that public opinion, political decision-making, and cultural differences (e.g. population group differences) are related to the communication process (Hansen, 1991). The structure of a community or society influences how the media portray environmental stories (Griffin & Dunwoody, 1997). Scientists and policymakers need to appreciate that the public is heterogeneous and compiled of diverse individuals who form their own perceptions and opinions. Scientists

and the media therefore need to understand how the public perceives the environment where they live and work, and how this influences the value they place on the environment (Cantrill, 1998).

Public engagement is important (Besley, 2015). The public should be treated as citizens involved in two-way communication, allowing for a balance between economic, social and environmental needs (Brulle, 2010). This allows for the *critical or contextual (public engagement of science) model* of science communication (Burns, O'Connor & Stocklmayer, 2003). This model states that environmental researchers, policymakers, and the media need to listen to the perspectives of the public to respond in a way that their communication efforts result in effective decision-making concerning environmental problems (Bakuwa, 2015). The effect of the media should be included in all studies regarding environmental awareness and understanding (Harrison, Burgess & Filius, 1996).

Environmental communication includes the study of public perceptions, opinions, persuasion and the strategy of how something is communicated (Besley, 2015). Different variables, including, socio-demographic factors, values, emotions, and behavioural processes (Barr, 2003; Jefferson *et al.*, 2014; Stamm *et al.*, 2000) influence the perceptions, awareness attitude and behaviour of people, not just information provided by the media. The public's perception about the environment often links back through mass media into ongoing formulations of environmental management (Boykoff, 2009). The future of communication of environmental issues depends on the perceived importance of the environment by the public (Anderson, 1991).

2.5.2 Environmental perceptions framework

“Environmental perception has been adopted as a diagnostic tool since the UNESCO's Man and the Biosphere program of 1968, which declared the study of environmental perception as a fundamental tool for the management of places and landscapes” (Röschel, 2016:7). Since the 1970s, it has been recognised that perceptions, attitudes and beliefs must be taken into consideration by the practical approach to solve environmental problems (Tuan, 1974), as individual awareness and subsequent concerns regarding environmental challenges are at the heart of environmental management and protection (Abdulkarim *et al.*, 2017; Shen & Saijo, 2007). Therefore, it is important to ask how different publics (segments of a population) differ with regard to environmental perceptions (Carlson, 2004; Scott & Fern, 1994). It has been shown that both scientific knowledge about the environment and the perceptions of citizens can result in a more valuable assessment of environmental change and challenges (Klintenberg *et al.*, 2007; Paço & Lavrador, 2017). Also see Figure 2.1.

Socio-demographic variables such as age, educational attainment, race, and income may be factors playing a role in a person's ability to interpret environmental issues (Stern, 2000). Different people will interpret and respond to the same environmental information in highly variable ways (Blake, 1999). Researchers have long tried to identify the variables responsible for environmental perceptions, concern and attitudes (Van Liere & Dunlap, 1980), as differences in perceptions and attitudes toward the environment can clearly be observed (Gelissen, 2007).

A variety of values exist in any society (Gelissen, 2007). For each environmental problem, there are a variety of perceptions created by diverse individuals and at various times and places (Whyte, 1977). All individuals might not have clear beliefs about all environmental challenges, but instead choose particular environmental issues that they care more about (Schaffrin, 2011). It is therefore important to study how people view their particular environments (Rauwald & Moore, 2002). However, little consensus has been reached regarding the most important socio-demographic variables influencing environmental concern (Klineberg, McKeever & Rothenbach, 1998).

2.6 Problem statement and research questions

This dissertation explores variables potentially influencing a specific South African urban public's perceptions of the environment and environmental challenges. It aims to ultimately understand the public's knowledge and perceptions of environmental challenges better as well the socio-demographic factors and information sources that influence this knowledge and perceptions. It has been stated that to solve or improve environmental problems, it is important to assess people's perceptions, awareness, knowledge and attitudes toward the issue or problem (Aminrad, Zakaria & Hadi, 2011).

This dissertation evaluates six socio-demographic variables: religion, gender, population group, age, household income and level of education. Gender and age were selected as they have history of explaining environmental concern (Berenguer, Corraliza & Martin, 2005). Religion was selected because previous research is inconclusive (Biel & Nilsson, 2005; Clements, 2012) and it is a variable that has not yet been researched in South Africa. Because of the social history of South Africa and multi-culturism, and because little is known about the perceptions of people of colour, population group was selected (Johnson, Bowker & Cordell, 2004). Socio-economic status and education was included in the study, because it has consistently been found to play an important part in predicting the public's environmental concern (Clements, 2012; Cottrell, 2003). These variables will be discussed in detail in the literature review.

Environmental knowledge is an important variable explaining environmental behaviour (Myung, 2017), and was therefore included in the research. It is also important to study the process by which individuals receive information about environmental problems (Halford & Sheehan, 1991). In exploring these issues, academics have developed a wide range of questions to measure environmental concern, beliefs and attitudes (Daniels, Krosnick, Tichy & Tompson, 2013).

2.6.1 Research questions

This dissertation addresses seven sets of questions based on the assumption that the environmental perceptions and understanding of South Africans concerning their natural environment is influenced by socio-demographic variables, knowledge and the source of information about environmental problems (Figure 2.2).

1. What are the perceptions of the environment and environmental degradation for the public of various socio-economic backgrounds (dependent variables)?
 - What are the perceived environmental challenges/problems?

- How important are environmental issues considered in comparison to other issues in the community?
2. Which socio-demographic variables influence the perception of environmental challenges (independent variables)?
 - Do perceptions differ as a function of gender, race, age, religious affiliation, education and household income?
 3. What are the main sources of environmental information (independent variables)?
 - What socio-demographic variables influence environmental information sources?
 4. How knowledgeable are individuals about the environment?
 - What socio-demographic variables influence environmental knowledge (independent variables)?
 5. Is there a relationship between environmental knowledge and information sources used?
 6. What are the strongest variables influencing the publics' perception of environmental challenges?
 7. To what extent do publics differ in their perceptions toward environmental challenges?

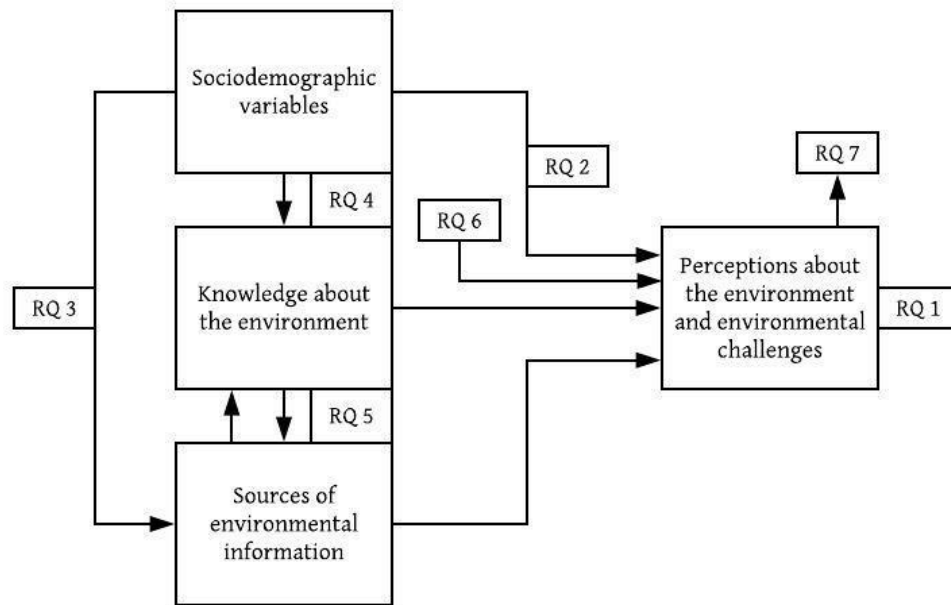


Figure 2.2. Conceptual framework with research questions

The conceptual framework (Figure 2.1) will guide answering the research questions (Figure 2.2). This leads to the research concerning the public's perceptions of environmental problems.

Chapter 3: Literature review

3.1. Introduction

Within social sciences, research efforts into peoples' perceptions of environmental problems have largely focused on identifying factors that encourage an individual human being to show concern for the environment and natural resources and, therefore, reasons for environmental concern continues to be a prominent topic of research (Bennett *et al.*, 2017; Huddart-Kennedy, Beckley, McFarlane & Nadeau, 2009).

Walton and Austin (2011) provide a timeline of the sociological research of the increase in environmental concern and environmentally friendly activities since the 1970s. The field was dominated by quantitative studies aimed at constructing measures of environmental concern and attitude., followed This was followed by an attempt to find the socio-demographic correlates of environmental concern. Since the 1990s studies in the field attempt to define the determinants of pro-environmental behaviour (Walton & Austin, 2011).

This chapter provides the literature review relating to environmental communication, perceptions, awareness, concern, knowledge and behaviour. This literature review illustrates the significance of the research as it adds to the body of literature relating to environmental perceptions in South Africa. First, it will deliberate on environmental communication. This is followed by a discussion about international perceptions of the environment. Then environmental perceptions in relation to six socio-demographic factors, religion, gender, race, ages, household income and education, are discussed. The chapter concludes with an overview of the literature review.

3.2. International environmental perceptions

The environment has emerged as a social and political issue since the late 20th and early 21st centuries (Anderson *et al.*, 2007; Marquart-Pyatt, 2007; Shen & Saijo, 2007; Whyte, 1977).

[...] [Public] support for the environment in the developing world represents a reactive response to high levels of air pollution, water contamination, and other environmental risks in society. In contrast, support for the environment in the developed world is deemed to be proactive and eco-centric in nature. (Alibeli & White, 2011)

Environmental issues around the world are multifaceted, interrelated, and often engrained in larger social issues. Therefore, it can be expected that individual and communal perceptions about the environment will be diverse and linked to social concerns (Hunter *et al.*, 2010). Although most people have heard about environmental issues, such as air or water pollution, they often fail to make a connection between the problem, the causes and the effects (Stamm *et al.*, 2000). Other supporting evidence comes from international surveys, in particular the *World Values Survey* (WVS), *International Social Survey Programme* (ISSP) and the *Health of the Planet Survey* (HOP) (Franzen, 2003). Since 1992, in the European Union (EU), the *Eurobarometer* has published results from a number of surveys about citizens' perceptions of environmental problems (Adelle & Withana, 2008). In the United States of America (USA), many surveys, including the *Gallup Poll*, *Harris Poll* and *Pew Surveys*, have a dedicated section with questions measuring perceptions about the environment

(Adelle & Withana, 2008). However, environmental concern across the globe is not homogenous. There is a need better to understand local perceptions, to ultimately shape policies and programmes to effectively prioritise and manage environmental issues (Gelissen, 2007; Hunter *et al.*, 2010).

The *Eurobarometer* survey conducted during 2007, surveying citizens from all member states part of the EU, indicated that 95% of European citizens felt that environmental protection is important (Adelle & Withana, 2008). This again emphasising the need for local studies about perceptions. In decreasing order, Europeans were most concerned about climate change (57%), water pollution (42%), air pollution (40%), man-made disasters such as industrial accidents (39%) and natural disasters such as floods (32%) (Adelle & Withana, 2008). It is essential to take into consideration that this survey showed that only 55% of the respondent felt informed about environmental issues and 42% felt they were inadequately informed (Adelle & Withana, 2008). The survey also shows that 86% of EU citizens felt they themselves needed to play a role in protecting the environment.

A *Gallup Poll* conducted in early 2008 in the USA indicated that Americans favour environmental protection even at the risk of limiting economic growth (Adelle & Withana, 2008). Polls conducted at the same time by the *Washington Post*, *ABC News* and *Stanford University*, collaboratively, show that of 1 002 American adults, 33% considered climate change to be the biggest global environmental problem, followed by air pollution (13%) (Adelle & Withana, 2008).

Cross-national survey analysis studies of environment perceptions point to difficulty of generalising these perceptions across geographic and cultural settings (Hunter *et al.*, 2010; Marquart-Pyatt, 2015). That is to say, developing nations are environmentally concerned, because they have direct experiences with environmental degradation, while citizens of more developed nations are more likely to support environmental protection because of cultural shifts and economic well-being (Brechtin & Kempton, 1994). Similarly, economically affluent countries agree that protecting the environment is important, more so than countries experiencing low economic growth (Struwig, 2010). Hunter *et al.* (2010) conclude in their research that global environmental concern is not homogenous, highlighting the necessity to better understand local perceptions of environmental issues: “Local environmental concern revolves around livelihoods, socio-economics, and the individual experience, while widespread international environmental concern exposes the globalization of human concerns” (Hunter *et al.* 2010:538).

3.3. Environmental communication

In recent years, environmental scientists, communicators, educators, policy makers and other stakeholders have shown a growing appreciation for the vital role played by environmental education outside of the school curriculum (Falk, 2005), in other words, environmental communication. Discourses about the environment and sustainable development need support from environmentalists, politicians and the public (Blake, 1999). Effective environmental messages, developed by environmental scientists and professional science communication experts, can influence public environmental perceptions and support action to solve

environmental challenges (Brulle, 2010). The most often mentioned functions of environmental communication include “informing, communicating scientific reality, portraying science accurately and creating awareness among a non-technical [lay] audience” (Jarreau *et al.*, 2015:149).

Environmental communication is “a social process, with social consequences of how people live” (Rademakers, 2004:8). The more people pay attention to environmental messages, the more probable they are to engage in a variety of environmentally friendly activities (Cottrell & Graefe, 1997; Huang, 2016). Thus, environmental communication plays an important role in defining humans’ relationship with nature (Anderson, 1991). This is explained by Hungerford and Volk’s (1990) *Theorised Behavioural Change System* (Figure 3.1). This linear model is based on the assumption that when individuals become more knowledgeable about the environment and environmental challenges, they will also become more aware of the environment and its problems, and therefore be more inspired to act environmentally responsible (Hungerford & Volk, 1990).

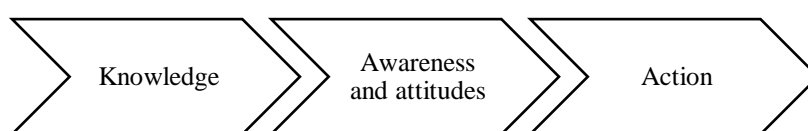


Figure 3.1. Theorised behavioural change system (Hungerford & Volk, 1990:258)

This is in line with the statement that, “knowledge impacts attitudes which impact behaviour” (Levy, Orion & Leshem, 2018:308), which is consistent with research stating that knowledge-based campaigns are a popular way of promoting pro-environmental behaviour (Frick *et al.*, 2004). This was evidenced in research by Mobley *et al.*’s. (2010) qualitative research which indicates that respondents who read more environmental literature are more likely to act in an environmentally friendly manner. Research during the 1980s also indicates that there is a correlation between attention to environmental content in mass media, especially newspapers, and environmental concern.

However, it is now argued that environmental concern and environmental behaviour cannot be explained by a linear model. Internal factors, such as environmental knowledge awareness, as well as external factors, such as socio-demographic variables, ultimately influence environmental behaviour (Figure 3.2) (Kollmuss & Agyeman, 2002). There is also evidence of the effects of media on the public’s environmental perceptions, concern and knowledge (Huang, 2016). There is a clear correlation between public concern for the environment and coverage of the environment in the media (Berger, 1997).

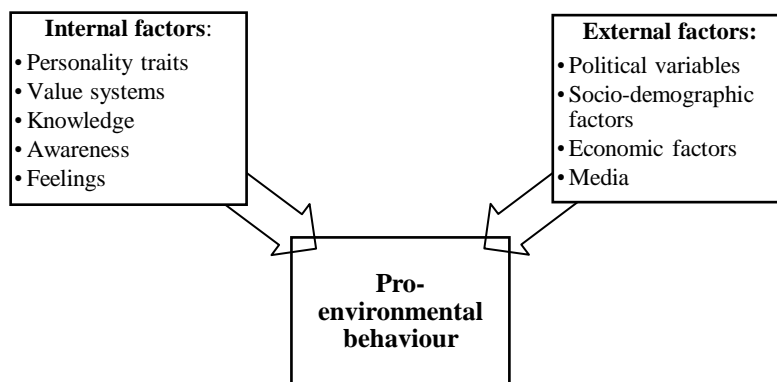


Figure 3.2. Model of pro-environmental behaviour according to Kollmuss and Agyeman (2002)

Since the increase in environmental concern during the 1970s, the mass media have been central in the discourse of environmental issues with the public (Anderson, 1991; Hansen, 2011) and the majority of people get their information about environmental issues, i.e., climate change, from the media (Huang, 2016). The way that the media provides us with news influences people's view of the world (Lomborg, 2001). The public gets informed about the environment from a wide variety of sources, including: the school education system, books from both libraries and retail outlets, museums, science centres, zoos, aquariums, botanical gardens, arboretums, parks and nature reserves, television programming and films, newspapers, radio programmes, magazines, the Internet, NGOs and through discussions with friends and family (Falk, 2005). Types of information flows include face-to-face conversation, public discussion, debate and mediation, scholarly and informal publications, marketing of environment-related information, digital communication, and mass media communication (Janpol & Dilts, 2016; Pillmann, 2002). The latter is discussed in the following section.

3.3.1. Environmental communication and the media

"[...] [The] view of the environment [...] is shaped by the images and messages that confront us each day on television, in the newspapers, in political statements and in the conversations at work and at the kitchen table" (Lomborg, 2001:3). During the 1950s and 1960s environmental problems and challenges were only infrequently discussed in newspapers and scientific journals (Hansen, 1991; Pleasant *et al.*, 2002; Takala, 1991). Before 1970 environmental communication was rare (Berger, 2002; Lester, 2010). Connections between the environment and the media gained greater importance during the late 1960s and 1970s, as specialists and researchers gained more understanding into the relationship between anthropogenic activities and the environment (Boykoff, 2009). It was only during the second half of the 1980s that global environmental problems in the media became significant (Takala, 1991) and journalism started playing an important role in identifying and solving environmental problems (Berger, 2002; Lester, 2010). For decades since, various environmental media campaigns have been used to improve people's awareness of environmental issues, as most of what people hear about environmental problems come from the media (Boykoff, 2009; Major & Atwood, 2004; Rademakers, 2004; Takács-Sánta, 2007). The media identifies environmental problems,

specifies issues for public debate, and can even set agendas (Heberlein, 1981). The mass media have given a voice to the environment by presenting environmental change and challenges in specific ways (Boykoff, 2009). Media representations of environmental problems influence public perceptions and understanding may contribute to deeply held beliefs about the state of the environment (Besley & Shanahan, 2004; Carvalho, 2009; Goodman, Littler, Brockington & Boykoff, 2016; Hansen, 1991; Levy-Leboyer, Bonnes, Chase, Ferreira-marques & Pawlik, 1996; Miller & Pollak, 2013; Pillmann, 2002; Shanahan *et al.*, 1997; Takács-Sánta, 2007; Willers, 1996). The media can cause people to have attitudes toward environmental issues, even if a certain issue does not affect them directly (Heberlein, 1981; Huang, 2016).

The media varies from entertainment to news media, covering films, television, radio, books, newspapers, magazines, flyers and, more recently, the Internet (Anderson, 1991; Boykoff, 2009; Ladle *et al.*, 2005). Once an environmental problem has been picked up by the media, increased interest often follows quickly in the general public and consequently among policymakers (Likens, 2010), although most people do not participate in formal environmental education programmes. Most people rather receive their information from newspapers, radio and television programmes (Shanahan *et al.*, 1997; Willers, 1996). The media is therefore a powerful tool for influencing and changing public perceptions (Ladle *et al.*, 2005; Thaker *et al.*, 2017). Consequently, what is seen as important by the media is usually what the public sees as important (Rademakers, 2004; Sampei & Aoyagi-Usui, 2009). The media can and should be used to influence attitudes, strengthen ecological values, improve an individual's environmental knowledge and increase pro-environmental behaviour (Berger, 2002; Lester, 2010). Coverage of environmental problems in the media now range from issues related to the Earth's natural environment, to those relating to environmental threats to the health of living things (Giannoulis, Botetzagias & Skanavis, 2010).

Local communities are dependent on scientists' and government officials' explanations of environmental challenges; they often rely on the news media for the flow of information from scientific and government experts, to community residents (Boykoff, 2009; Major & Atwood, 2004). Non-scientists rely on the media to 'translate' scientific research into accessible and popular forms of information (Nadkarni, 2002). A variety of media are vital sources of information for shaping opinions about science and technology for the public (Carvalho, 2007; Kalof, 1998; Ladle *et al.*, 2005), including environmental science.

Few environmental studies focus on the influence of media use, but existing research indicates a positive impact of the media on environmental awareness and knowledge (Huang, 2016). Public opinion surveys have measured the relationship between media coverage of environmental issues and trends in environmental concern (Hansen, 2011). It is easy to assume that people who have access to media content and other information resources are more informed about certain issues compared to those who have little or no access (Anderson, 1991; Bakuwa, 2015; Huang, 2016).

The source of environmental information has its own significance in how environmental knowledge is understood by the public (Stern, 1992). Historically, television, radio and press media have had a big

responsibility of ensuring that environmental matters are communicated effectively, accurately, and in such a way that it promotes pro-environmental action (Anderson, 1991), news being the main source of environmental communication (Hansen, 2011). Documentary programmes and films on television were also powerful media for presenting information on complex issues, such as environmental change (Blewitt, 2011; Halford & Sheehan, 1991), and existing literature shows that exposure to environmental documentaries can influence a person's environmental knowledge (Arendt & Matthes, 2016). Television channels or programmes (e.g. the *Discovery Channel*) are regarded as trustworthy sources of environmental information. This is followed by university scientists, then science magazines (e.g. *Popular Science*) and science website and blogs in the last place (Brewer & Ley, 2013).

In the USA, 42% of African American college students in Houston, Texas use multiple sources to get information about the environment, with television being the leading source (35% local; 42.1% national and 44% international environmental news), with the Internet coming in second (15.4% overall), but it was noted that the majority of the students did not watch nature and environmental-based programmes (Bun Lee, 2008).

In India, TV use is significant in predicting risk perception about climate change and supporting policies. However, Internet use is negatively associated with policy support and perceptions about climate change risk (Thaker *et al.*, 2017). In a study done on where citizens got their environmental news in Ohio, USA, general television was used the most, followed by the Internet and then newspapers (Lacy *et al.*, 2007).

Currently, online media is playing an ever-increasingly important role in environmental communication (Blewitt, 2011; Ladle *et al.*, 2005). Recent research shows that television is still some individuals' main source of information, followed by the Internet, then newspapers and radio (Boykoff, 2009; Buckley *et al.*, 2017). There has been change from traditional documentary style of television broadcasting to more modern environmental programmes with clear campaigning efforts (Anderson, 1991). The media now has access to visually appealing images and information about the negative nature of environmental issues (Anderson, 1991).

While the media covers a wide and varied range of environmental issues and challenges, the most covered issue has been that of climate change (Hansen, 2011). This is unsurprising as the climate change debate "draws much media attention" (Hansen, 2011). In Malawi, a developing southern African country, the majority of the public got information about climate change through various media (Bakuwa, 2015). In Malawi, radio was the primary source of information, followed by television, newspaper articles, and lastly the Internet (Bakuwa, 2015).

Socio-demographic variables also influence media use. In Botswana, another southern African country, gender, education and age influence the media source individuals use to get information about the environment, but more research needs to be done fully to understand the roles these socio-demographic variables play (Thakadu & Tau, 2012). Older people and relatively lower educated individuals watch more television than young, well-educated people, with women having slightly higher exposure to television than men (Besley & Shanahan, 2004). In Japan women are more likely to have less useful knowledge about environmental issues

(Hiramatsu, Kurisu & Hanaki, 2016). Women are also less likely to read conservation and environmental literature than men (Johnson *et al.*, 2004). In the USA women, when compared to men, trusted news media more as a source of environmental information (Brewer & Ley, 2013).

As for newspaper exposure, surveys indicate that older men, relatively better educated people and rural citizens were more inclined to read more newspapers (Besley & Shanahan, 2004). In the USA, older African-Americans also watch more television to get informed about the environment (Holbert, Kwak, & Shah, 2003). Older males also tend to watch more nature documentaries than females of the same age category (Holbert, Kwak & Shah, 2003). Similarly, telephonic surveys show that African Americans trust television news as a source of environmental information (Brewer & Ley, 2013).

Organisations aimed at promoting pro-environmental behaviour should make full use of a variety of media, including traditional media and the Internet (Huang, 2016). The mass media can therefore influence national policy responses. The media's extensive coverage of global warming and related environmental issues has "created public concern and a call for political commitment" (Weingart, Engels & Pansegrau, 2000, p. 261).

3.3.2. Environmental knowledge

"[Environmental communication] may have an impact on a person's environmental knowledge and attitudes and may therefore foster a person's environmental competence" (Liefländer & Bogner, 2018:611). Environmental knowledge and values can explain 40% of the variance of pro-environmental behaviour (Kaiser, Wölfling & Fuhrer, 1996), therefore a shortage of environmental knowledge or believing false information might limit environmentally friendly behaviour (Vicente-Molina, Fernandez-Sainz & Izagirre-Olaizola, 2013). Knowledge of the environment includes the knowledge about the problems and their consequences, and also how to take action (Liefländer & Bogner, 2018). Environmental knowledge can be explained as an individual's knowledge and confidence in discussing environmental issues with others (Jain & Kaur, 2006). There is a clear distinction between environmental knowledge and between environmental perceptions and awareness, which can be described as an individual's familiarity with environmental issues (Jain & Kaur, 2006).

[...] knowledge might serve as an additional link between environmental concern and environmental behavior: someone who is very much concerned about the environment in general will be more active if the person knows what to do in order to, for example, reduce carbon emissions in the context of climate change. (Schaffrin, 2011:17).

Some research shows that the public's general levels of environmental knowledge is not very high (see Levine & Strube, 2012). However, it needs to be taken into account that even when environmental knowledge levels are low, concern for the environment can often still be high (Dunlap *et al.*, 1993; White & Hunter, 2009). The *NEETF/Roper Survey* in 2000 asked more than 1 500 people in the USA about their environmental knowledge. Environmental literacy in the USA was low, with more than two-thirds of the sample failing a simple environmental knowledge quiz (National Environmental Education and Training Foundation, 2000). Scores

on a 12-question knowledge test also conducted in the USA indicate that participants exhibited little knowledge of environmental issues (Levine & Strube, 2012). Knowledge about environmental challenges facing the world is even lower in third world than in first world countries (Bloom, 1995).

The main focus of environmental communication programmes should be to change environmental behaviour through increasing environmental knowledge (Cottrell & Graefe, 1997; Levine & Strube, 2012; Oreg & Katz-Gerro, 2006). Information should become a resource for improving environmental knowledge and creating decision-making competence, ultimately leading to pro-environmental behaviour and thus a sustainable environment (Kaiser *et al.*, 1996; Mobley, Vagias & DeWard, 2010; Pillmann, 2002).

Socio-demographic variables influence the knowledge of an individual. Previous research indicates that males are more knowledgeable about the environment than females (Blocker & Eckberg, 1997; Levine & Strube, 2012; Sharma, 2016). The *National Geographic Survey 2001* indicate that education levels can also influence knowledge about environmental issues (Mobley *et al.*, 2010). Research undertaken in the USA indicate that an individual's level of education is an important indicator of environmental knowledge (Chanda, 1999; Liefländer & Bogner, 2018). In Indonesia, Taiwan and India, all three developing countries, surveys have shown that the education level of an individual shows a positive relationship with knowledge about the environment and environmental issues (Jain & Kaur, 2006; O'Brien, 2007; Sudarmadi, Suzuki, Kawada & Netti, 2001). One of the main reasons for this could be that formal education can result in exposure to wider a variety of media sources of knowledge (Chanda, 1999).

“The challenge for those advocating environmental policy is to find ways to make information salient to the public, a public with knowledge that is roughly right but can easily be confused [...]” (Henry, 2000:29)

3.3.3. Environmental communication and policies

The whole system of science, society and the environment is evolving in fundamental ways (Lubchenco, 1998).

Several factors led to the rise of the environment to the top of the political agenda. First of all, there was an accumulation of scientific evidence about environmental deterioration. [...] A second factor which led to the environment becoming a prominent issue on the political agenda in the late 1980s was growing public concern about environmental issues.” (Anderson, 1991:462)

Researchers and consequently policy makers, are becoming increasingly aware that individual attitudes and behaviours can either improve or intensify environmental problems and challenges (Mobley *et al.*, 2010). It is now known that improving environmental problems often requires changes in perception and behaviour of a diverse group of stakeholders, not just governments and industries (Brewer, 2009). Citizens are now targets of policies and are therefore stakeholders in the same way as organisations (Brewer, 2009). Environmental messages developed by professional communication experts favourably guide public perceptions and support policy and legislation (Brulle, 2010; Carvalho, 2007; Harring, Jagers & Matti, 2017; Inglehart, 1995).

Policies tend to assume that providing environmental information and education will lead to behavioural change, when behavioural change is actually dependent on the public's interpretation of environmental issues (Eden, 1996). The framing of environmental news coverage may influence how the public perceives the environmental news (Hansen, 2011). Research show that there is a the relationship between the public's environmental concern and how the media covers environmental news (Hansen, 2011). Research on news coverage of environmental problems adds to the understanding of why some environmental issues are successfully constructed for public concern and why some problems are disregarded by the public (Hansen, 2011).

Since the 1960s there has been an increase in the number of international environmental organisations, which focus on creating awareness about environmental problems and challenges (Takala, 1991). Interested groups developing research and policies in environmental protection and conservation include academics, non-governmental and -profit organisations, governmental agencies, political parties and campaigning organisations (Burningham & O'Brien, 1994).

Researching environmental perceptions from the public's perspective is relevant for public policy, because ultimately it is the public that will bear the costs and consequences of environmental degradation (Paswan, Guzmán & Lewin, 2017). Two factors are required to overcome global environmental degradation: practical policies and support for policy measures (Harring *et al.*, 2017; Inglehart, 1995; Rauwald & Moore, 2002).

"The public's views and values on the environment have important implications for policy. It would be difficult for policies to be made and implemented which did not hold the general support of the public." (Adelle & Withana, 2008: 7) Since the 1980s, questions raised about environmental communication have largely moved away from "is the environment changing?" and "do humans play a role in environmental change?" to more textured considerations of governance and politics (Boykoff, 2009). For example, a lot of research has addressed questions concerning how effectively to manage environmental challenges, and how to construct and maintain action plans to help and support the most vulnerable communities (Boykoff, 2009).

The formulation of environmental policies also should include how knowledgeable the public is about the environment and also what this knowledge means to different social groups (Eden, 1998). Mass media articles on political and economic costs and benefits play an integral part in framing considerations for policy action as well as public understanding and engagement (Boykoff, 2009). Managing of environmental resources and protected areas should make citizens part of the conservation effort, but also allow them to share in the benefits of these initiatives (Beckett, 2013; De Beer & Marais, 2005). Policy-makers should use the "best available evidence from research to inform decisions about policies" and management programmes and should extend beyond just government structures to include all stakeholders (Soomai, 2012, p. 158). Without community participation, the protection and management of the environment will become progressively impossible (De Beer & Marais, 2005).

For example, the British government is doing so by addressing the need for government strategies for waste management, by emphasising socio-political and economic measures and including the role and opinion of individual consumers and households (Swami, Chamorro-Premuzic, Snelgar & Furnham, 2011). De Beer and Marais (2005:56) state, “A successful partnership [between management and communities] depends on a large degree of knowledge and attitude [...] the two groups need to respect each other’s knowledge and perceptions and [...] work towards a shared vision, understanding and development approach”. Understanding the public’s views on environmental quality is important, as it will determine the extent to which the public will take the right environmental action, and support public policies aimed at improving environmental quality (Johnson & Scicchitano, 2000).

3.4. Socio-demographic variables influencing environmental perceptions

One way a positive attitude toward the environment can be developed and promoted is to understand the relationship between socio-demographic variables and environmental attitudes and behaviours (Zelezny, Chua & Aldrich, 2000):

“Sociodemographic variables are generally found to be associated with the citizen’s environmental concern, yet the direction and significance of some of these correlations vary across studies.” (Liu and Mu, 2016:117)

Different social groups experience vastly different living circumstances in the locations that form the settings of their daily lives (King, 2014). The complex relationship between socio-demographic variables and citizens’ environmental perceptions primarily focuses on identifying the types of individuals who are likely to be the most concerned about the environment and environmental challenges (Diamantopoulos, Schlegelmilch, Sinkovics & Bohlen 2003; Liu *et al.*, 2014). Socio-demographic variables are used to describe individuals in relation to their status and role in society (Whyte, 1977).

Many environmental issues can be cultural, economic, and social (Eden, 1998) and not all cultures or other segments within a society face the same challenges (Arbuthnot & Linng, 1975; Gifford, Steg & Reser 2011). This approach typically focuses on standard individual socio-demographic variables (Rhead, 2015) and, as seen in this chapter, a great number of studies have contributed to this subject matter (Liu *et al.*, 2014). A common finding is that socio-demographic factors influence the perceptions the public has about environmental challenges (Anderson *et al.*, 2007; Anderson *et al.*, 2010; Klineberg *et al.*, 1998; Pisano & Lubell, 2017; Scott & Fern, 1994; White & Hunter, 2009). However, there is surprisingly little agreement regarding which particular socio-demographic variables are associated with environmental perceptions (Klineberg *et al.*, 1998). This could stem from survey techniques, methodologies and measures of environmental concern (Shen & Saijo, 2008). These variables will be discussed, in turn, in the following section.

One of the earliest studies of the effect of socio-demographics on environmental awareness was *The Socially Conscious Consumer* by Anderson and Cunningham (1972). The results show a strong correlation between environmental consciousness and occupation, age, and socio-economic status (Anderson & Cunningham,

1972). A multi-level analysis of the 2010 *International Social Survey Programme* (ISSP) data reveal that an individual's environmental concern depends on his or her socio-demographic variables, such as, gender, education, age and income (Franzen & Vogl, 2013; Liu *et al.*, 2014). Other research also indicate that age, gender, education, income and race influence environmental perceptions and concern (Greenberg, 2005; Schultz & Zelezny, 1998).

Environmentalism is extremely diverse in South Africa and reflects the social divisions in gender, population group, and class (Cock & Fig, 2001). Socio-demographic factors with a strong relationship to environmental perceptions in South Africa, are age and education. Race and gender have been shown to have weaker relationships, but are still theoretically interesting (Dietz *et al.*, 1998).

3.4.1. Religious orientation

Many researchers have raised the thought that concern about environmental problems are related to religious orientation and beliefs (Biel & Nilsson, 2005; Blocker & Eckberg, 1997; Blocker & Eckberg, 1989; Bord *et al.*, 1998; Guth *et al.*, 1995; Hand & Van Liere, 1984; Kanagy & Nelsen, 1995). The role of religion in environmental perceptions varies across studies, but it has been indicated that concern for the environment is likely to be linked to a specific religious belief (Dietz *et al.*, 1998; Guth *et al.*, 1995). Religion can be seen as a personal and social factor, as many people grow up in religious households (Gifford & Nilsson, 2014). Social interaction is also part of many religious activities (Gifford & Nilsson, 2014). Religious books can be responsible for creating links between religious values and environmental concerns and behaviour (Biel & Nilsson, 2005).

Research from surveys show that secular Americans are pro-environmental (Guth *et al.*, 1995) and that Non-Judeo-Christians also show a slightly greater concern for environmental issues (Greeley, 1993; Hand & Van Liere, 1984). Protestants in the USA also view environmental problems as less of a priority compared to other social problems. Data from the *British Panel Household Survey* (BHPS) from 2008 to 2009 argue that non-Christians are more likely to spend money on the environment and engage in individual pro-environmental consumer behaviour (Clements, 2012). Another survey also revealed that religious individuals (active participants, born again and those who claim personal religious practices) are less likely to support environmental government funding (Kanagy & Nelsen, 1995).

A South African study finds no significant relationship between religion (measured in hours spent praying) and concern for the environment (Struwig, 2010). This suggests that more research should be done to determine the effect of religion on environmental perceptions. The complexity of the relationship between religion and environmental concern needs to be understood (Kanagy & Nelsen, 1995).

3.4.2. Gender

The relationship between gender and environmental perceptions is still very vague and not one true explanation exists (Fawzi, Ameen & Mourshed, 2017; Shen & Saijo, 2007; Van Liere & Dunlap, 1980). However, gender differences may arise when the environment is viewed as a commodity (Blocker & Eckberg, 1989).

Gender affected behavioural intentions both directly and indirectly. Females expressed stronger behavioural intentions, even with beliefs and values controlled, and in addition, held different values and beliefs from males. Without controlling for values, females believed more strongly that environmental conditions have negative consequences for self, others, and the biosphere. (Stern & Dietz, 1994:77)

As early as 1983, surveys research indicates that women show higher levels of concern for the environment compared to men (McStay & Dunlap, 1983; Tindall *et al.*, 2017). Surveys also indicate that women also tend to show more concern about risks associated with environmental challenges (Barr, 2003; Biel & Nilsson, 2005; Dietz *et al.*, 1998; Dow, 1992). Literature suggests that gender differences exist in response to a variety of environmental issues regarding health and safety matters (Blocker & Eckberg, 1989). This is known as *environmental sympathy* (Guth *et al.*, 1995).

Being female is a strong, consistent predictor of the degree of a person's environmental concern. Surveys show that women may be more aware of environmental problems (Liu & Mu, 2016), and show greater concern for the environment than men (Blake, 2001; Blocker & Eckberg, 1989; Liu *et al.*, 2016; Luchs & Mooradian, 2012; McMillan, Hoban, Clifford & Brant, 1997; Plavsic, 2013; Shen & Saijo, 2007). Women also hold stronger attitudes toward the environment compared to males (Clements, 2012; Diamantopoulos *et al.*, 2003; Tikka *et al.*, 2000), as witnessed in four countries: Germany, Japan, Sweden and the USA (Eisler, Eisler & Yoshida, 2003). In ten out of 14 countries, questionnaires indicate that females reported attitudes that are more in support of the environment than males (Zelezny *et al.*, 2000).

Data from the 1993 *General Social Survey* (GSS) explained that women hold more powerful environmental beliefs compared to men (Dietz *et al.*, 1998). Women perceive environmental threats as more severe than men and rate environmental problems as more serious (Armah *et al.*, 2015; Biel & Nilsson, 2005; Lai & Tao, 2003; Roeschel *et al.*, 2016; White & Hunter, 2009). Eisler *et al.* (2003) go on to explain that this might be because they might be more sensitive to consequences of environmental change.

Surveys results indicate that women tend to exhibit more pro-environmental behaviour than men (Clark, Kotchen & Moore, 2003; Clements, 2012; Diamantopoulos *et al.*, 2003; Mainieri, Barnett, Valdero, Unipan & Oskamp, 1997; Mobley *et al.*, 2010; Newman & Fernandes, 2016; Steel, 1996; Tindall *et al.*, 2017). In a cross-national study across 14 countries females reported greater participation in pro-environmental behaviours and activities in eleven of the countries (Zelezny *et al.*, 2000). Women are also more willing to pay for the costs of environmental protection (Gelissen, 2007; Klineberg *et al.*, 1998), show the results from the *European Value Survey* (EVS) 1999/2000 (Torgler, García Valiñas & Macintyre, 2008).

In South African men (35.9%) are more likely to agree with the statement "There are more important things to do in life than protect the environment", than women (29.0%) (Struwig, 2010). Another study, using household surveys, indicates that females are most concerned about pollution, litter and waste as environmental problems. Research in more parts of South Africa discovered that female heads of households are more likely, than men, to see water pollution as an significant environmental issue (Hunter *et al.*, 2010). Women are more

likely to be in support of ecosystem service than men (Mensah, Veldtman, Assogbadjo, Ham, Kakai & Seifert, 2017). Women could be inclined to show pro-environmental behaviour, because of the differences in gender socialisation and gender roles (Phuphisith, Kurisu & Hanaki, 2016). The role of women as caregivers and nurturers can result in more concern for the natural environment and the conservation of life (Torgler *et al.*, 2008).

3.4.3. Population group

Environmental perceptions may vary between population groups despite similarity for other socio-demographic factors (Johnson *et al.*, 2004). Research in the United States reveals that African Americans are significantly less concerned about the environment than white Americans, and African Americans are less likely to engage in recycling activities (Bakuwa, 2015; Hunter, Hatch & Johnson, 2004). Surveys show that African Americans are also significantly less likely than their white counterparts to read environmental or conservation literature (Johnson *et al.*, 2004). The difference in concern for the environment between white and African individuals has been hypothesised as due to African Americans' generally lower household income (Mohai, 1990). Qualitative research shows that members from the black African community in South Africa do not have strong perceptions about the environment, mainly due to a lack of interest (Ballantyne & Oelofse, 1999). Black South Africans are less concerned for the environment than coloured, Indian and white citizens (Struwig, 2010). When population groups are measured in relation to environmental concern in South Africa, quantitative and qualitative research indicate that 50% of the white respondents express environmental concern, while 30% of the coloured and only 16% of the African respondents express concern (Willers, 1996). When South Africans were asked to either *agree* or *disagree* (they also had the option of stating *uncertain*) with the following statement: "There are more important things to do in life than protect the environment", coloured respondents were the most inclined (40.1%) to believe there were more important things to do than protect the environment. This was followed by African respondents (32.3%), Indians (31.6%) and then white people (25.3%) (Struwig, 2010).

Research using questionnaires show that white South Africans also visit national parks four times more than other racial groups (Turpie, 2003). There are also strong population group differences in knowledge about fynbos, with African respondents being less familiar with fynbos than other racial groups (Turpie, 2003). The population group differences in South Africa are not surprising given the history of exclusivity regarding environmental resources. It shows that population group has the biggest influence on environmental concern (Struwig, 2010).

3.4.4. Age

Age is a significant predictor of environmental concern (Buttel & Flinn, 1978; Jones & Dunlap, 1992; Mobley *et al.*, 2010; Mohai & Twight, 1987; Shen & Saijo, 2007). Results from the GSS (1974 – 1990) reveals that younger adults are more concerned about the environment than older adults (Jones & Dunlap, 1992). Data from a *CBS News* and *New York Time* opinion poll indicates that younger adults, ages 18 to 29, are more in support of maintaining current environmental laws (Anthony, 1982).

The *age hypothesis* states that younger people are more concerned about environmental degradation than older people (Fransson & Gärling, 1999; Scott & Fern, 1994; Van Liere & Dunlap, 1980). Where there are age differences, surveys show that young respondents are more concerned with and sensitive to environmental problems and environmental quality (Biel & Nilsson, 2005; Burger *et al.*, 2000; Diamantopoulos *et al.*, 2003; Klineberg *et al.*, 1998; McMillan *et al.*, 1997), and supportive of positive environmental change (Buttel & Flinn, 1978). A possible reason for this could be that younger individuals are less integrated in the existing social order (Van Liere & Dunlap, 1980). Older individuals may also be more concerned about protecting wealth and social standings they have acquired over time, or they rather might want to preserve economic and social opportunities for their descendants (Mohai & Twight, 1987). However, some literature from survey results does indicate that older individuals exhibit strong pro-environmentally friendly behaviour (Clements, 2012; Diamantopoulos *et al.*, 2003; Holbert *et al.*, 2003; Johnson & Onwuegbuzie, 2004; Morrison & Beer, 2017; Olli, Grendstad & Wollebaek, 2001; Pisano & Lubell, 2017; Shen & Saijo, 2008; Steel, 1996).

Higher age is positively correlated with a higher perceived knowledge of the environment (Witzling, Shaw & Amato, 2015). Older individuals might perceive environmental hazards as more threatening compared with younger individuals (Lai & Tao, 2003). Changes in perceptions about environmental challenges associated with the aging process can be seen as a result of biological, psychological and/or social changes as an individual gets older (Mohai & Twight, 1987).

In South Africa, younger individuals (ages 18 – 29) are less concerned about the environment than older individuals (Rousseau & Venter, 2001). One possible explanation, gathered from questionnaire research, is that young people might still need to be educated regarding the importance of environmental conservation (Rousseau & Venter, 2001). Older citizens from rural South Africa are more likely to rate dirty river or dams as a serious environmental problem (Hunter *et al.*, 2010) and value ecological services as more important than younger individuals (Mensah *et al.*, 2017). Nonetheless, research indicates that there are significant differences in environmental concern between various age groups between individuals of various environmental backgrounds (Struwig, 2010).

3.4.5. Household income

Some researchers argue that concern for environmental challenges is related to the socio-economic status of an individual or the wealth of a society (White & Hunter, 2009). This is known as the *social-class hypothesis* (Fransson & Gärling, 1999; Shen & Saijo, 2007). It rests on the assumption that concern for the environment has similar properties to luxury goods, which can be enjoyed only after more basic material needs are met (Shen & Saijo, 2007; Van Liere & Dunlap, 1980). Research indicates that this is the most consistent factor determining environmental perceptions (Cottrell, 2003; Kemmelmeier *et al.*, 2002).

Three-quarters of the poor of developing countries live in environmentally fragile areas (Dow, 1992), and although there is some awareness of environmental problems, the question remains how important they are perceived in comparison with other issues on the national agenda. However, the start of grass-root

environmental organisations, in many developing countries, serves as evidence that there is an increase in environmental concern (Bi *et al.*, 2010). In Costa Rica, a developing country, the environment is not seen as a major concern when ranked with other national problems (Holl *et al.*, 1995). When respondents were asked to state the three most important environmental challenges facing society, without being given examples, the most commonly stated global and national problems were deforestation, waste management and water and air pollution.

It is generally accepted that populations of wealthy nations are more likely to express high levels of environmental concern and indicate that it is of great importance to address environmental problems (Marquart-Pyatt, 2007). Data from the ISSP 1993 composed of 22 countries reveals that greater economic prosperity in a society is related to greater concern for the environment (Diekmann & Franzen, 1999; Kimmelmeier *et al.*, 2002). Likewise, results from the ISSP done in 32 countries in 2000 reveals that a higher proportion of residents of wealthier states prefer general environmental protection to economic growth, in comparison to residents in poorer countries (Franzen, 2003). Poorer countries may have more pressing problems than environmental issues and are therefore more concerned about those problems (Franzen, 2003; Struwig, 2010). Survey results show that minority groups might be more likely to be more preoccupied with issues like poverty and crime, than to care about environmental issues (Klineberg *et al.*, 1998). Middle and upper class citizens have provided for their basic needs and can now focus on other aspects of life (Struwig, 2010; Van Liere & Dunlap, 1980).

Household income per capita has a significantly positive effect on concern for the environment (Liu & Mu, 2016). Surveys indicate higher levels of socio-economic status typically correlates with emphasis on good environmental quality and environmental support (Gelissen, 2007; Inglehart, 1995; Van Liere & Dunlap, 1980). Households with higher incomes are more likely give money to environmental organizations and they are also more likely to act environmentally friendly (Berger, 1997; Clark *et al.*, 2003; Klineberg *et al.*, 1998). In China, households with higher incomes also have had a better understanding of environmental problems (Hao, 2014).

Marginalised communities tend to have less access to resources to understand and cope with environmental challenges (Dow, 1992), whereas a high household income may lead to greater access to information resources on “green” consumption behaviour and pro-environmental behaviour (Klineberg *et al.*, 1998). Similarly, those who have access to environmentally friendly services, such as recycling facilities, are more likely to act better toward the environment (Barr, 2003).

However, lower class communities may also be aware of the poor environmental conditions in which they live (Van Liere & Dunlap, 1980). Lower income groups perceive threats to the environment as more severe than those with high incomes (Biel & Nilsson, 2005). Societies in lower household income may express general environmental concern, but it may receive less support when compared to other social and economic problems and concerns (Gelissen, 2007; Marquart-Pyatt, 2007; White & Hunter, 2009). Analysed results from the

1990/1991 WVS similarly indicate that publics of low income countries show high levels of interest in protecting the environment (Inglehart, 1995).

In rural parts of South Africa, most of the survey respondents perceived environmental problems as “very serious” (Hunter *et al.*, 2010). Respondents ranked water availability and quality, soil erosion, bushfires and pollution as the most serious local environmental concerns. However, a large proportion of the respondents could not single out the most important environmental issue (Hunter *et al.*, 2010). Research revealed that environmental issues are not the top priority of informal settlements (Ballantyne & Oelofse, 1999). Survey research also indicate that individuals with lower household income levels in South Africa are less concerned for the environment in comparison with citizens from higher income groups (Struwig, 2010). This is supported by research that indicates that higher income rural households are more in support of ecosystem services than households with lower incomes (Mensah *et al.*, 2017). South Africans from higher income groups also consider themselves having a more active interest in nature (Turpie, 2003).

3.4.6. Education

Education is a good predictor of environmental awareness, knowledge and subsequent behaviour (Aminrad *et al.*, 2011; Arbuthnot & Linng, 1975; Ostman & Parker, 1987). It is one of the most consistent correlates of environmental awareness and concern (Chanda, 1999; Clements, 2012; Daniels *et al.*, 2012; Mobley *et al.*, 2010; Mohai & Twight, 1987; Shen & Saijo, 2007; Steel, 1996; Willers, 1996). Fourteen years of GSS data (1973-1990) reveal that well-educated individuals had somewhat higher levels of environmental concern than less-educated individuals (Jones & Dunlap, 1992). Even one additional year of schooling could increase the concern an individual has for the environment (Liu & Mu, 2016).

Individuals with any kind of tertiary education, are more likely to engage in reading about the environmental and other conservation literature (Bi *et al.*, 2010; Johnson & Onwuegbuzie, 2004a). Higher educated individuals are more committed to protecting the environment (Klineberg *et al.*, 1998). In the USA, surveys indicate that higher levels of education was related to higher levels of awareness of environmental problems and higher levels of support for bettering the environment (Buttel & Flinn, 1978; Gelissen, 2007; McMillan *et al.*, 1997).

More knowledgeable individuals act more environmentally friendly are more likely to conserve the environment, and are committed to environmental protection strategies, in comparison with someone that knows nothing about conservation practices (Corral-Verdugo, 1997; Derksen & Gartell, 1993; Klineberg *et al.*, 1998; Markowitz *et al.*, 2012). Results from the 2010 GSS indicate that more educated individuals are more likely to be environmentally friendly consumers, sign environmental petitions and be more willing to protect the environment (Dietz *et al.*, 1998; Klineberg *et al.*, 1998; Newman & Fernandes, 2016). Similarly, the *World Value Survey* analysis indicates that higher levels of educational achievement are associated with support for the natural environment (Gelissen, 2007).

Findings are similar in South Africa as in other countries. Previous research, using surveys as a tool, in South Africa reveals that higher levels of education has a positive relationship with environmental concern (Willers, 1996). A linear relationship exists between level of education and environmental concern. Individuals with lower education are less concerned about the environment, and highly educated individuals are more concerned (Beckett, 2013; Rousseau & Venter, 2001; Struwig, 2010). Where individuals see pollution as a problem, highly educated individuals are more willing to take action against the problem (Anderson *et al.*, 2007).

3.5. Segmentation research

In research trying to determine the Swiss population's perceptions of science, the results divide the population into four distinct categories: (1) those who had high knowledge of science and had high interest and trust in science, (2) those who had equal amounts of knowledge to the first group, but were less interested in and had less trust in science, (3) those who had moderate trust in science, but shared some reservations, and (4) those who supported science the least (Schäfer, Füchslin, Metag, Kristiansen & Rauchfleisch, 2018).

Research into South Africans' cultural distance to science determined three publics (Guenther, Weingart & Meyer, 2018). The first public that is close to science has high levels of education and a high monthly income. The second public who is moderately close to science has moderate levels of education and an average monthly income. The third public is distant to science and has low levels of education and income.

3.6. Conclusions

Concluding from the literature review, the following hypotheses emerge with respect to research questions RQ2, RQ3, RQ5 and RQ7. These hypotheses can be used to create improvements on the conceptual framework of the research (Figure 3.3).

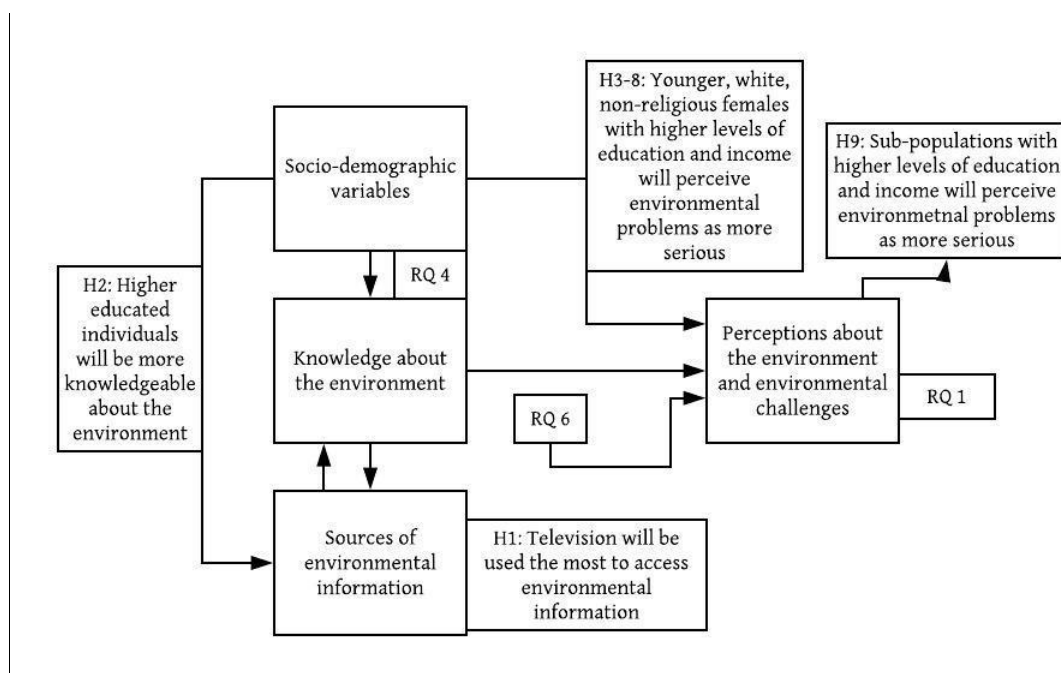


Figure 3.3. Conceptual framework including hypotheses

Environmental information sources. The literature suggests that television, followed by newspapers and the Internet will be used the most by individuals to gain access about environmental information.

H1: Television will be used to most by the sample as a source of environmental information.

Environmental knowledge. There is a positive relationship between the level of education of an individual and how knowledgeable the individual is about the environment.

H2: More highly educated individuals will have more knowledge about the environment.

The study of socio-demographic characteristics as a correlate of environmental perceptions is quite a popular research topic (Jain & Kaur, 2006). It is not easy to draw direct conclusions for the relationship between socio-demographic factors and perceptions about the environment (Jain & Kaur, 2006). However, in the literature review the researcher discussed the effect of six socio-demographic variables on the environmental perceptions of individuals: religious orientation, gender, population group, age, household income and education.

Religion. There is a predominantly negative relationship with environmental concern. Research indicate that secular individuals and non-Christians show more concern for the environment than their counterparts. Religious individuals are less likely to spend money on the environment and also less likely to support government funding on the environment.

H3: Secular individuals will perceive environmental problems as more serious than religious individuals.

Gender. Numerous international studies have found that women express greater concern for the environment than men. Women also engage in pro-environmental behaviour more than men do.

H4: Females will express greater concern for the environment and view environmental issues as more severe.

Population group. The research has primarily indicated that white individuals have more positive perceptions about the environment and are more concerned about the environment. Multiple South African studies indicate that the white community expressed more concern for the environment and were more likely to view environmental problems as severe.

H5: The white part of the population will show more concern for the environment than the African and coloured part of the population.

Age. Research investigating age as a predictor of environmental perceptions return mixed results, although the literature predominantly indicates that younger individuals are more concerned about the environment and environmental problems. This is similar to what has been found in South Africa.

H6: Younger individuals will perceive environmental problems as more severe than their older counterparts.

Income. The income level of an individual emerged as an important correlate of environmental perceptions. The literature indicates that individuals with higher household incomes are more concerned about the environment. They are also more likely to spend money on the environment and show pro-environmental behaviour.

H7: A higher income will lead to higher levels of concern for the environment (view them as more serious).

Education. It is clear that a higher level of education is positively correlated with a higher concern for the environment, higher knowledge about environmental issues and pro-environmental behaviour.

H8: Individuals with higher levels of education will view environmental problems as more serious.

This suggests that a typical individual that is concerned about the environment is most likely to be a young Caucasian, non-religious, female, with a high level of education and from a high-income household. In general, the findings in the literature review point to the usefulness of socio-demographic research in profiling an environmental concerned individual.

Segmentation analysis. Population groups can be divided into subgroups according to their perceptions to science. Groups with high levels of education and income have more knowledge about the science and trust science more. Therefore, it can be expected that there will be subgroups in the research population concerning their perceptions and knowledge about the environment and environmental problems.

H9: Individuals with high levels of education levels and monthly income will be having more knowledge about the environment and perceive environmental problems as more severe.

.

Chapter 4: Research design and methods

The perceptions of the public towards the environment and environmental challenges were examined in Stellenbosch, South Africa. Figure 4.1 illustrates the steps of conceptualisation, data collection and analysis for the dissertation (based on Onwuegbuzie & Leech, 2006).

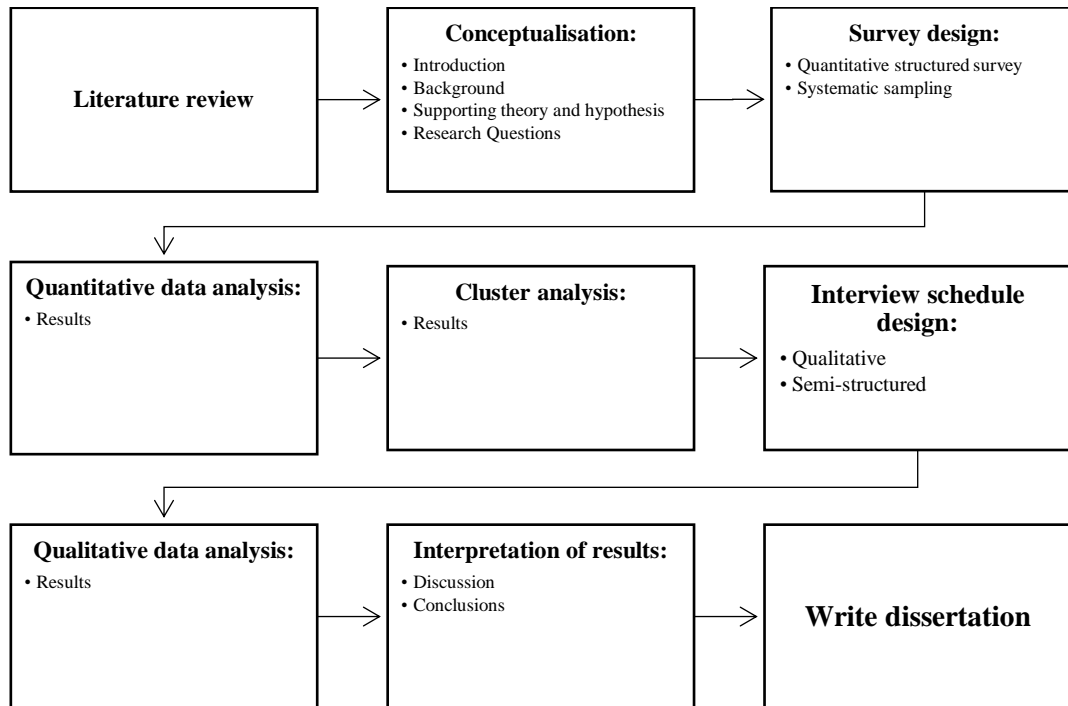


Figure 4.1. Methodological framework for the study

4.1. Research location

The study was conducted in Stellenbosch (33.9321° S; 18.8602° E), an urban, agricultural town (the main export is wine (Van Weele & Maree, 2013) in the Western Cape (33.2278° S; 21.8569° E), South Africa (Figures 4.2 and 4.3).

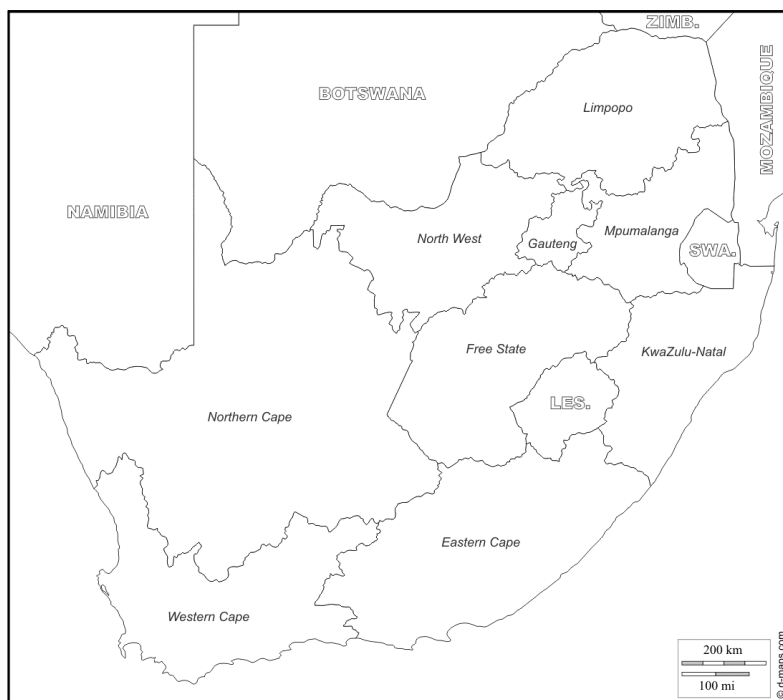


Figure 4.2. Map of South Africa indicating the location of the Western Cape (Source: http://d-maps.com/carte.php?num_car=4415&lang=en; accessed 26 July 2017)

The Western Cape is blessed with natural beauty that includes the unique fynbos vegetation, mountain ranges and beautiful shorelines, but also possesses a cultural diversity with a long and rich history. These factors, along with internationally recognised wine and fruit industries, make the Western Cape one of the world's greatest tourist attractions. (Van Weele & Maree 2013:8)

The Western Cape attracts international interest in conservation and management programmes and is high on the agenda for many South African scientists and conservationists (Turpie, 2003). However, national support for the conservation of the Western Cape and other areas are declining as other social needs are considered more important (Turpie, 2003). Part of the reason for this is that little is known of the social value of this region's biodiversity or that of the country as a whole (Turpie, 2003).

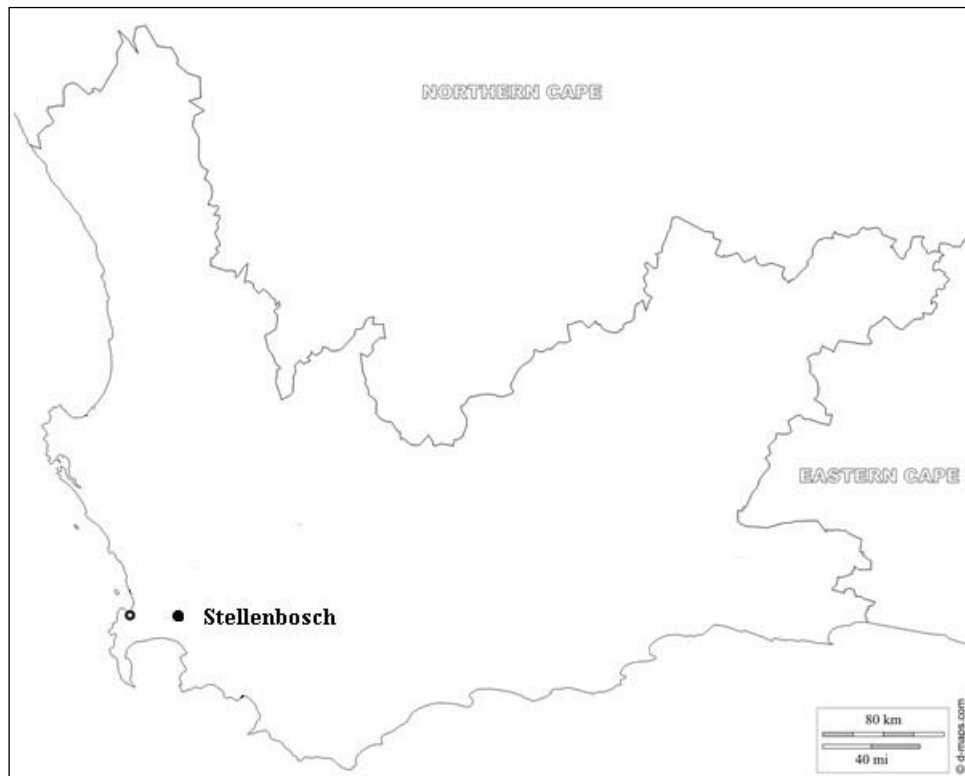


Figure 4.3. Map of the Western Cape indicating the location of Stellenbosch (Source: http://d-maps.com/carte.php?num_car=89813&lang=en; accessed 26 July 2017)

The Stellenbosch local municipality falls under the broader Cape Winelands District Municipality (Van Weele & Maree, 2013) and covers an area of 821 km². The majority of the Western Cape's population (> 80%) is situated in the Cape Winelands and the City of Cape Town (Van Weele & Maree, 2013). The Stellenbosch municipality serves a total of 155 733 people (Statistics South Africa, 2011). The population's ethnic composition, during the most recent country-wide census, of Stellenbosch is representative of that of the Western Cape: 52.2% coloured, 28.1% African, 18.5% white and 1.2% other races (Stats SA, 2011). Of the Stellenbosch population, more than 70% is of working age (15–64) with an unemployment rate of 15.2%, which is less than the overall rate of the province (Stats SA, 2011). The highest proportion of Stellenbosch citizens also receive no form of income (Table 4.1) (Stats SA, 2011). More than 60% of the citizens of Stellenbosch speak Afrikaans (Naidoo, 2005; Stats SA, 2011) and more than half of the population is female (51%) (Stats SA, 2011). The main religion of the Stellenbosch community is Christianity, with 87.8% of respondents stating that they are Christian (Naidoo, 2005).

Table 4.1. Average monthly household income for citizens from Stellenbosch (Stats SA, 2011)

Income	Percentage
No income	20.6%
R1–R4 800	2.1%
R4 801–R9 600	3.5%
R9 601–R19 600	10.2%
R19 601–R38 200	16.5%
R38 201–R76 4000	15.5%
R76 401–R153 800	11.5%
R153 801–R307 600	8.5%
R307 601–R614 400	6.6%
R614 001–R1 228 800	3.3%
R1 228 801–R2 457 600	1.0%
R2 457 601+	0.7%

Stellenbosch is home to the Jonkershoek Nature Reserve, the Stellenbosch University Botanical Garden, the JS Marais Park, other urban parks and numerous wine farms with their own protected natural areas. Three rivers flow through the area: the Eerste River, the Plankenbrug River and the Krom River.

To assess environmental perceptions of the Stellenbosch public, a survey and follow-up interviews were conducted in four different Stellenbosch communities (Langlois, 2012). This ensured a heterogeneous public (Van Liere & Dunlap, 1980). Ethical approval to conduct the research on human subjects was obtained from the Research Ethics Committee: Humanities, Stellenbosch University (ID: 451, Project nr: CREST-2017-0451-251). Verbal consent sheets, following the university's protocol, explained the purpose of the study and assured anonymity. Therefore, the research was conducted according to accepted and applicable national and international ethical guidelines and principles. The project was funded by the Chair in Science Communication at the Centre of Evaluation, Science and Technology (CREST), Stellenbosch University.

4.2. Data collection

In this dissertation the researcher focuses on evaluating environmental perceptions and their determinants. In the past, public opinion surveys have shown to be a valuable source of information regarding the public's perception about environmental challenges (Bloom, 1995). However, a fixed mixed-method approach of data collection was used to address the research questions at the local level (Haq & Ahmed, 2017). This is defined as including at least one quantitative and one qualitative method of data collection as determined before data collection (Caracelli & Greene, 1993; Creswell & Clark, 2011) and can be used to study perceptions (Bennett,

2016). Mixed-method perception-based studies are more efficient and comprehensive than other alternatives. It provides important insights in how to gather support for and therefore improve conservation efforts (Bennett, 2016).

Using a mixed-method approach allows for both breadth and depth during the research (Bickerstaff & Walker, 2001). In the case of this research, the quantitative data collection was used to answer the research questions and the qualitative data is used to gain more insights (Bewket, 2012), however both methods are still of equal importance (Creswell & Clark, 2011). The rationale for mixing both quantitative and qualitative data collection methods during the research process, is based on the fact that neither of the methods by themselves are sufficient fully to capture the trends and details of the situation (Ivankova, Creswell, & Stick, 2006). By using a mixed-methods approach, findings can be generalised to a broader population and a detailed explanation can be developed (Bird, 2009).

A development framework is used, where the results from one method is used to help develop or inform the other method (Creswell & Clark, 2011). The mixed-method data collection followed that of an exploratory sequential transformative (sequential explanatory) strategy, a two-phase process (Creswell & Clark, 2011; Creswell, 2009; Ivankova *et al.*, 2006)(Creswell, 2009; Ivankova *et al.*, 2006), where one of the research methods are used to help explain findings generated by the other (Bryman, 2012). The initial phase is the quantitative data collection, followed by a second phase of qualitative data collection. This framework is useful to assess relationships and trends as seen in the quantitative data, and then explain the reasons behind these trends (Creswell & Clark, 2011). A structured survey questionnaire allows the interviewer to collect information about perceptions and knowledge the interviewee has about the environment and “makes the data comparable within the data set” (Bird, 2009; Creswell & Clark, 2011; Henry, 2000; White, Jennings, Renwick, & Barker, 2005).

4.3. Quantitative data collection

The initial phase of data collection was done during August and September of 2017. During the first phase, survey data was collected using a survey tool. Surveys are considered a good tool for collecting data on interdisciplinary studies that comprise of ecological and non-ecological (e.g. social) aspects (White *et al.*, 2005). Quantitative surveys help to identify the factors that influence perceptions about the environment. It also helps best to understand the predictors of that outcome (Bird, 2009). It also predicts and controls for factors that might determine environmental concern and behaviour (Newman & Fernandes, 2016). The quantitative design is also a good tool to use to determine if there are significant differences between groups investigated (Alyaz *et al.*, 2017).

Random stratified sampling was used to ensure the representativeness of the sample and allow the researcher to generalize the results to the larger Stellenbosch population (Abdulkarim *et al.*, 2017; Creswell, 2009). The first phase allowed for statistical analysis of the data, testing for statistical significance (Onwuegbuzie & Leech, 2004) and consequently hypothesis testing (Johnson & Onwuegbuzie, 2004).

4.3.1. Survey design

During the survey phase, data was collected during face-to-face interviews using an orally structured survey questionnaire that consisted of both open-ended and close-ended questions (Anthony, 2007; Kaoje, Sabir, Yusuf, Jimoh & Raji, 2017; Nyanga, Johnsen, Aune & Kalinda, 2011; Turpie, 2003). Open-ended questions were included to capture unanticipated answers (Campbell & Cooke, 1971).

Surveys are an effective, traditional means of collecting data about a population (Mbewe, 2016). The benefits of conducting face-to-face interviews include higher response rates, clarification of questions, complex questions can be asked, visual prompts can be used and the interviewer can motivate the interviewee (Bakuwa, 2015; Bird, 2009). The surveys were done anonymously to allow respondents to respond freely to the questions, especially those questions that may have been considered more sensitive (Hu, Urlie, Yuan & Xiao, 2002).

The survey questionnaire design was based on related studies and on the review of the literature (Yore, Hand & Florence, 2004). The survey schedule is divided into five sections and eleven items (Addendum 1). The order of the questions ranged from general to more specific. This avoided suggesting answers to follow-up questions (Campbell & Cooke, 1971).

The first section asks about perceptions of environmental issues and other social issues (Dunlap, 1989). This included open-ended questions about the environment in general, the perceptions of social and environmental problems the South African society and respondent's community/neighbourhood might face (Dunlap & Van Liere, 1978). These open-ended questions are included to capture more detailed information from the respondents answers (Ballantyne & Oelofse, 1999; Fawzi *et al.*, 2017). The seriousness of South African environmental issues is measured with the help of a four-point Likert-scale (1 = not serious at all, 2 = not too serious, 3 = serious and 4 = very serious) (Bakuwa, 2015; García-Mira *et al.*, 2005; Haq & Ahmed, 2017; Scott & Fern, 1994; Shen & Saijo, 2008; Wang & Cheng, 2017).

The second section asked the respondents how often they access sources about environmental information, again using a four-point Likert-scale question (1 = never, 2 = rarely, 3 = often and 4 = regularly) (Bardsley & Edwards-Jones, 2007; Scott & Fern, 1994). Self-reporting measures in media use has been commonly used to explore media influences on human behaviour (Janpol & Dilts, 2016).

This was followed by a section on environmental knowledge determining self-reported knowledge (Vicente-Molina *et al.*, 2013; Zelezny *et al.*, 2000), and measured knowledge, in the form of true-or-false statements (1 = true or 0 = false) (Diekmann & Preisendörfer, 1998; Levy-Leboyer *et al.*, 1996; Michalos, Creech, McDonald & Kahkle, 2009; Paço & Lavrador, 2017; Ren & Folta, 2016; Shanahan & McComas, 1997; Vicente-Molina *et al.*, 2013). These statements were related to general environmental situations South Africa was experiencing at the time of the study (Myung, 2017), e.g. drought, poaching, pollution, climate change and habitat destruction (IndexMundi, 2018).

In the last section of the survey schedule, the researcher deals with socio-demographic variables (Armah *et al.*, 2015; Dietz *et al.*, 1998; Jefferson *et al.*, 2014; Myung, 2017; Pisano & Lubell, 2017; Shen & Saijo, 2008; Vicente-Molina *et al.*, 2013; Vorkinn & Riese, 2001). Socio-demographic measures are objective and relatively easy to obtain (Whyte, 1977). The socio-demographic variables were selected based on previous research (Shen & Saijo, 2008; Vorkinn & Riese, 2001). Data on socio-demographic variables include gender, population group, age, marital status, number of children, household size, level of education, employment status, religious affiliation, and household income. Lastly, the interviewee was asked to provide their contact information (telephone number or email address) if they were willing to discuss environmental perceptions in more detail during the qualitative data selection phase (Ren & Folta, 2016).

The survey schedules were first written in English then translated into Afrikaans and Xhosa, (Addendum 1). These are the three main languages spoken in Stellenbosch (Stats SA, 2011). Afrikaans and Xhosa surveys questionnaires were translated back to English to insure accuracy. Participants had the choice of being questioned in any of the languages (Ballantyne & Oelofse, 1999). According to Phuphisith *et al.* (2016), this removes any possible language barriers and makes it easier for the interviewee to understand the questions.

The survey English questionnaire were pre-tested by two departmental members, five field assistants and seven random residents from Stellenbosch. This included people from various backgrounds and all ages (over 18 years old). To establish validity of the survey questionnaire, it was also reviewed by four research staff members at CREST, Stellenbosch University. The survey questionnaire was modified and improved and a final survey schedule was created. The average duration for the interviews in each neighbourhood was 19.48 minutes ($SD = 9.56$) in Kayamandi, 32.08 minutes ($SD = 18.46$) in Cloetesville, 16.67 minutes ($SD = 5.44$) in Onderpappegaaiberg and 16.29 minutes ($SD = 5.63$) in Jonkershoek. The overall average interview duration was 21.48 minutes ($SD = 13.23$).

4.3.2. Measures

4.3.2.1. Dependant variables

The survey questionnaire asked a range of questions about the environment in general and environmental issues. Open-ended and Likert-scale questions were used to measure following:

1. the public's general idea about the environment (open-ended);
2. how the public rate environmental problems in South Africa in comparison to seven other social problems South Africa faces (Likert);
3. what the public considers to be the most serious environmental problem in South Africa and in the communities/neighbourhoods they live (open-ended);
4. how the public rates eleven environmental problems South Africa may face (Likert);
5. how the public rates their own knowledge about the environmental (Likert);
6. where the public receives most of their knowledge about environmental issues (ten sources) (Likert), and;

7. the public's knowledge about the environment and eleven typical South African environmental issues (true-or-false).

4.3.2.2. Independent variables

The socio-demographic variables (and how they were coded) were used as independent variables (see Addendum 2 for codebook) (Raudsepp, 2001). Gender is a dummy variable, 1 for men and 2 for women. Population group (race) is a dummy variable with 1 for white, 2 for African, 3 for coloured and 4 for other races. Age is an interval-level variable where 1 is for ages 18–29, 2 for 30–39, 3 for 40–49, 4 for 50–59 and 5 for 60+ years old. Marriage status was coded as a dummy variable where 1 is for married and 2 for unmarried. The number of children an individual had as well as the household size was coded openly. Education level (not to be used interchangeably with levels of environmental knowledge) and employment status are both dummy variables; education level was coded as 0 for no education, 1 for completing primary school, 2 for completing up until grade 9/GET, 3 for completing high school, 4 for a diploma or certificate at a FET college and 5 for any tertiary education at a university; employment status was coded as 1 for full time employment, 2 for part time employment, 3 when an individual was unemployed or looking for work, 4 for a retired individual, 5 when the interviewee was a stay-at-home parent and 6 if the interviewee was a full-time student. Religious affiliation was coded as a dummy variable to indicate if the individual was religious or not (1 for yes and 2 for no) and the affiliation was coded openly. The last variable, monthly household income, was another interval-level variable with 0 for no income, 1 for R1–R750, 2 for R752–R1 500, 3 for R1 501–R4 000, 4 for R4 001–R 7 000, 5 for R7 001–R16 500, 6 for R16 501–R33 000, 7 for R33 001–R57 000, 8 for R57 001–R123 500, 9 for R123 501–R196 500 and 10 for R196 501+.

4.3.3. Research assistant selection and training

Research assistants were selected for the study and trained to ensure competence and accuracy of the information to be collected during the surveys (Kaoje *et al.*, 2017). Assistants were needed to help with quantitative data collection, as data was collected from various population groups, speaking various languages and having different levels of literacy.

Seven local young men and one older man were recruited as research assistants to act as surveyors for the study (Bakuwa, 2015). This minimised the research bias that comes along with studies involving more than one culture or population group, especially concerning differences in race and languages (Anthony, 2007). Each research assistant signed a confidentiality agreement (Addendum 3) to protect the identities and information of the people interviewed, as well as an indemnity form (Addendum 4) to exclude the main researcher and Stellenbosch University of any liability.

Six of the men were honours degree graduates: four were continuing with their post-graduate studies and two were unemployed at the time of the survey data collection. The sixth individual was an unemployed high school graduate, but a citizen of one of the neighbourhoods. This allowed them to be flexible with their time and the data collection was undisturbed and completed in six weeks, starting in August 2017. All researchers

underwent training to prepare them for the data collection process. The training familiarised them with the survey questionnaire and how to record responses, the interview process and their role during this process, how they should present themselves and represent Stellenbosch University.

4.3.4. Population

The entire population was selected within the Stellenbosch town limits. Individuals over the ages of 18 were interviewed for the survey (Holl *et al.*, 1995; Maestre-Andrés *et al.*, 2016); 18 years and older are seen as adults and they are most likely to have gone through the school system, being exposed to some kind of environmental education. They are also most likely to be employed. To minimise bias toward unemployed individuals, interviews were conducted after working hours (16h00 – 18h00) (Holl *et al.*, 1995) or over weekends, and sometimes during daylight hours, when needed (Anthony, 2007). In some cases, interviewers also had to go back at a more suitable time for the respondent. No incentives were offered to take part in the survey. When an individual at a house was approached for an interview, they were informed about the nature of the research and interview by the research assistants: asked for the head of the household when possible (Bakuwa, 2015), told that their participation was voluntary and that they could opt-out of the interview at any time, the time commitment (approximately 20 minutes), the age requirements (18 years or older) and asked for verbal consent. Interviewers also explained that the respondents' responses were confidential and that there were no right or wrong answers (White, 2011). Respondents were advised that they had the right to withdraw at any time during the survey questionnaire (see Addenda 1 and 5 for details) (Casey & Scott, 2006). Respondents were also given a hard copy of the details as well as the contact details of the main researcher (Addendum 5).

Only one adult per household was surveyed and researchers were instructed to conduct the survey individually and to avoid family gatherings (Anthony, 2007). The goal was to survey at least 200 households from the four selected neighbourhoods in the Stellenbosch areas: Kayamandi (lower class), Cloetesville (lower class), Onderpapegaaiberg (middle-class) and the Jonkershoek (upper class) area (includes two neighbourhoods, Uniedal and Rozendal) (Figures 4.4 and 4.5), 50 at each neighbourhood. Kayamandi is predominantly populated by African Xhosa-speaking individuals and Cloetesville is inhabited mainly by coloured individuals who speak mostly Afrikaans (Naidoo, 2005).

In line with the purpose of the research, neighbourhoods were selected to include all races, income levels and education levels to have demographic heterogeneity (Chanda, 1999; Robinson, 2014) This was done to ensure that individuals in living in different areas of Stellenbosch were heard (Klitenberg *et al.*, 2007) and to ensure that an adequate number of respondents would be included in the survey (Armah *et al.*, 2015). The sample size of 200 respondents was considered to be a sufficient sample size to be representative of the Stellenbosch population, and therefore also the Western Cape. Houses were selected using systematic sampling:

k = sampling interval

N = number of houses in area/available households in a neighbourhood

n = number of houses that needs to be surveyed in an area

$$N/n = k$$

$$200/50 = 4$$

Systematic sampling has been widely used in research since the 1980s due to its simplicity (Iachan, 1982). One house in each neighbourhood section was selected from a random starting point and thereafter every fourth house was selected to be approached for the survey process. To deal with non-responses, if an individual did not want to take part in the survey or was not home, the interviewer moved on to either the house on the left or right, alternately (Anthony, 2007). Systematic sampling gives every household in the area an equal probability to be selected into the sample (Barreiro & Albandoz, 2001; Troidahl & Carter, 1964).



Figure 4.4. Geographical map of neighbourhoods where the data collection took place (Source: Google Earth)

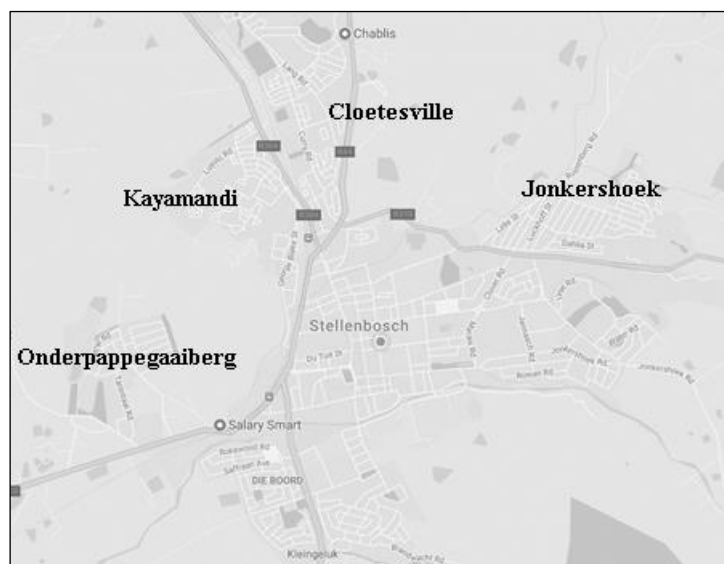


Figure 4.5. Road map of neighbourhoods where the data collection took place (Source: <https://www.google.co.za/maps/@-33.9294257,18.85666,13.7z?hl=en>; accessed 26 July 2017)

4.4. Quantitative data analysis

The survey data was entered in to Microsoft Excel 2016 and later processed and analysed in IBM SPSS (version 24.0) for Windows (Cottrell, 2003). A codebook was created before the data were analysed (Addendum 2). The codebook was used to guide and support the entering and analysis of the data into Excel and then imported into SPSS. The convenience of using the codebook is in its practicality by presenting the researchers with a precise set of variables during statistical analysis. Data were screened and cleaned in SPSS before analysis began. Some values were recoded: education level (recoded into 4 categories) and income (recoded into 5 categories). This allowed for easier analysis for some of the variables (Bakuwa, 2015). The data were first analysed using descriptive statistics and then using inferential statistics (Gioli, Khan & Scheffran, 2014; Ito & Kawazoe, 2017).

4.4.1. Descriptive statistics

In total 194, adults were interviewed from four neighbourhoods and completed the survey: 51 adults in Kayamandi, 50 adults in Cloetesville, 49 adults in Jonkershoek and 43 adults in Onderpappegaaiberg. Three survey questionnaires, one from Kayamandi, one from Cloetesville and one from Jonkershoek, were removed due to no usable information being given during the interview process, resulting in a total population of 191 individuals (response rate: 95.5%). All age and gender categories are well represented in the interviewed sample although females, white individuals and older age groups were slightly overrepresented compared to the census statistics.

Descriptive statistics were calculated to make the data more understandable and to depict the demographic profile of the sample (Alp, Ertepinar, Tekkaya & Yilmaz, 2006; Cottrell, 2003; Mbewe, 2016; Noorhosseini, Allahyari, Damalas & Moghaddam, 2017). The frequencies, (*n*) percentages (%) and standard deviation (*SD*)

of the population's socio-demographic data were determined (Table 4.2). Descriptive statistics on the indicators and scale frequencies, response percentages, means, and standard deviations (*SD*) were computed.

The sample was predominantly made up of white (46.6%), male (54.4%) and Afrikaans-speaking individuals (62.8%). The average age of respondents was 48.6 years of age (*SD* = 16.73), with the oldest interviewee being 84 years old and the youngest 18 years old. Most individuals had children (80.1%) and 2.24 (*SD* = 7.63) was the average number of children in a family. The socio-demographic profile of the total sample for each neighbourhood can be seen in Table 4.2. Indians and Asians are omitted from the population, as the interviewers did not come across Asian or Indian individuals.

Table 4.2. Socio-demographic characteristics (profile) of the quantitative sample

		Kayamandi		Cloetesville		Onderpapegaaiberg		Jonkershoek		Total sample	
		(N = 50)		(N = 49)		(N = 43)		(N = 49)		(N = 191)	
Variable		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender	Male	29	58	31	63.3	22	48.8	22	44.9	104	54.5
	Female	21	42	18	36.7	21	51.2	27	55.1	87	45.5
Race	White	0	0	0	0	40	93	49	100	89	46.6
	African	49	98	0	0	1	4.7	0	0	50	26.2
	Coloured	1	2	48	98	2	2.3	0	0	51	26.7
	Other	0	0	1	2	0	0	0	0	1	0.5
Language	Afrikaans	1	2	47	95.9	31	72.1	41	83.7	120	62.8
	English	0	0	1	2	11	25.6	7	14.3	19	9.9
	Xhosa	46	92	0	0	0	0	0	0	46	24.1
	Other	1	2	1	2	1	2.3	1	2	4	2.1
Age	18-29	14	28	3	6.1	10	23.3	0	0	27	14.1
	30-39	7	14	8	16.3	6	14	9	18.4	30	15.7
	40-49	12	24	7	14.3	7	16.3	10	20.4	36	18.8
	50-59	8	16	10	20.4	8	18.6	6	12.2	32	16.8
	60+	9	18	14	28.6	12	27.9	21	42.9	56	29.3
Marriage status	Married	19	38	33	67.3	24	55.8	40	81.6	116	60.7
	Unmarried	28	56	13	26.5	19	44.2	9	22.5	69	36.1
Household size (<i>m</i>)	-	5.26	-	5.32	-	3.16	-	3.4	-	4.33	-

		(SD = 2.570)		(SD = 2.285)		(SD = 1.413)		(SD = 1.469)		(SD = 2.242)	
Education level	None	3	6	2	4.1	0	0	0	0	5	2.6
	Primary School	9	18	8	16.3	0	0	0	0	17	8.9
	Grade 9/GET Phase	14	28	13	26.5	3	7	0	0	30	15.7
	High School/ Matriculated	11	22	16	32.7	8	18.6	4	8.2	39	20.4
	FET College	5	10	4	8.2	9	20.9	3	6.1	21	11
	University degree	8	16	5	10.2	23	53.5	40	81.6	76	39.8
Employment status	Unemployed	15	30	6	12.2	0	0	0	0	21	11
	Full time	11	22	22	44.9	24	55.8	13	26.5	70	36.6
	Part time	6	12	4	8.2	6	14	9	18.4	25	13.1
	Retired	9	18	12	24.5	7	16.3	22	44.9	50	26.2
	Stay at home parent	8	16	2	4.1	3	7	3	6.1	16	8.4
	Student	0	0	3	6.1	3	7	0	0	6	3.1
Income level	No income	5	10	3	6.1	0	0	1	2	9	4.7
	R0 – R750	2	4	0	0	1	2.3	0	0	3	1.6
	R751 – R1 500	5	10	3	6.1	0	0	3	6.1	8	4.2
	R1 501 – R4 000	23	46	4	8.2	2	4.7	0	0	29	15.2

	R4 001 – R7 000	9	18	5	10.2	2	4.7	0	0	14	7.3
	R7 001 – R16 500	1	2	6	12.2	8	18.6	11	22.4	12	6.3
	R1 6501 – R33 000	2	4	3	6.1	15	34.9	12	24.5	24	12.6
	R33 001 – R57 000	3	6	0	0	6	14	6	12.2	28	14.7
	R57 000 – R123 500	0	0	0	0	9	20.9	4	8.1	12	6.3
	R123 501 – R196 500	0	0	0	0	0	0	2	4.1	3	1.6
	R196 501 +	0	0	0	0	0	0	10	20.4	2	1
Religious	Yes	46	92	46	93.9	36	53.7	35	71.4	163	6.8.3
	No	2	4	1	2	4	9.3	6	12.2	13	6

4.4.2. Inferential statistics

Data for all variables were screened for outliers preceding data analysis (D'Antonio, Monz, Newman, Lawson & Taff, 2012). Internal consistency reliability was assessed using Cronbach's alpha (α) coefficient. It provides a single estimate of internal consistency or average correlation of survey questionnaire items, to measure the reliability of the question (Alp *et al.*, 2006; Arcury, 1990; Cottrell & Graefe, 1997; Fawzi *et al.*, 2017; O'Connor, Bord & Fisher, 1999). Cronbach's alpha for the Likert-scale data was $\alpha = 0.835$ for the environmental perception data, 0.769 for the information source data and 0.691 for the environmental knowledge data. This indicates a high level of internal consistency that suggest the measures are sensitive enough to measure high and low levels of environmental perceptions, information sources and environmental knowledge (Diamantopoulos *et al.*, 2003).

To define the environment and analyse other open-ended questions, a word-frequency analysis was used to detect the most commonly used phrases and words (Hiramatsu *et al.*, 2016). The comparison of social problems and environmental challenges in South Africa and between the neighbourhoods were analysed using mean and standard deviation statistics (RQ 1). Unanswered questions were excluded, resulting in different sample sizes for each social and environmental problem. The frequencies of the Likert-scale responses for the social problems and environmental problems were also calculated to support findings.

To analyse the influence of socio-demographics on perceptions of environmental problems (RQ 2) (11 items), sources used to access environmental information (RQ 3) (10 items), and environmental knowledge (RQ 4) (11 items), independent sample t-tests and univariate multiple regression analysis were used. Significance was indicated using a critical value of $p < 0.05$ (Cottrell, 2003; Jefferson *et al.*, 2014; Raudsepp, 2001; Shen & Saijo, 2008).

Independent samples t-test were used in order to compare the mean scores on a continuous variable for three independent groups of variables: gender, religious affiliation and education level (RQ2, 3 and 4) (Alp *et al.*, 2006; Beckett, 2013). The t-test indicate whether there is a statistically significant difference in the mean scores between the tested groups (Aminrad *et al.*, 2011; Beckett, 2013). A correlation analysis was done to determine if there is a relationship between environmental information sources used and knowledge about the environment (RQ 5), due to the complex association between media and the public understanding of scientific topics (Thaker *et al.*, 2017).

An ANOVA with a Duncan Post Hoc test for significance was performed (Alp *et al.*, 2006; De Lavega, 2004; Ifegbesan & Rampedi, 2018; Vorkinn & Riese, 2001). A linear relationship is assumed between the predictor variables (population group, age and income) and the outcome variables (environmental perceptions, information sources and environmental knowledge) (Beckett, 2013). The ANOVA compares the mean scores between more than one independent variable (Bakuwa, 2015; Beckett, 2013; Liu *et al.*, 2016).

A linear regression analysis was done to answer RQ 6, to determine the strongest influencing factors of the public's perception of environmental challenges (Anthony, 2007; Berenguer *et al.*, 2005; Best & Mayerl, 2013;

Clements, 2012; Franzen & Vogl, 2013; Hansla, Gamble, Juliusson & Gärling, 2008). Since this scale was an ordinal measure, linear regression was used (Query, 2005). The dependent variable used was an environmental perception scale measuring perceptions of environmental challenges on a total of eleven important environmental problems (Diamantopoulos *et al.*, 2003). The predictor variables used were an environmental knowledge scale (created from 11 Likert-scale statements), an information source scale (created from 10 Likert-scale questions) and socio-demographic variables (Diamantopoulos *et al.*, 2003).

Segmentation analysis was used to further develop a classification of the subgroups of the larger population (Guenther *et al.*, 2018; Hine *et al.*, 2014). This was done to answer RQ 7, to what extent do publics differ in their perceptions toward environmental challenges? The aim of the segmentation analysis is to determine groups among the population in regards with their perceptions toward the environment. Segments will be defined according to gender, religion, age, population group, household income and income (Balderjahn, 1988).

To develop these subgroups, cluster analysis was used (Guenther & Weingart, 2018). Clustering can be defined as “a data analysis technique that, when applied to a set of heterogeneous items, identifies homogeneous subgroups as defined by a given model or measure of similarity” (Almeida, Barbosa, Pais & Formosinho, 2007; Downs & Barnard, 2003:1; Tryfos, 1998).

During the cluster analysis, integration between the quantitative and qualitative analysis takes place. Here the methods are mixed before the final interpretation (Creswell & Clark, 2011). Mixed-methods design is useful when forming groups or clusters based on the quantitative results and to explain this phenomenon through subsequent qualitative research.

A hierarchical cluster analysis was performed to support findings from linear models (Henry, Tolan & Gorman-Smith, 2005). The hierarchical cluster analysis used Ward’s linkage method with squared Euclidian-distance measure to determine the number of clusters in the data (Bai, Dixon, Williams, Jeon, Lazenby & McCorkle, 2016; Murray & Hunfalvay, 2017).

The optimal number of clusters was determined using heuristic and formal methods (Gifford *et al.*, 2012). To select the optimal number of clusters, a dendrogram was used for a visual analysis. Hierarchical methods are intended to reveal nested structures of clusters within multivariate data (Henry *et al.*, 2005). It is a good method of identifying underlying structures of variables (Almeida *et al.*, 2007). Hierarchical clustering techniques are perhaps the most popular of all the multitude of cluster methods, and the literature surrounding them is enormous (Everitt, 2018).

4.5. Qualitative data collection

The second phase of the study involved in-depth qualitative interviewing during February and March 2018. This allowed selected individual participants freely to express their understanding of environmental challenges and quality (Ballantyne & Oelofse, 1999; Møller, Haustein & Bohlbro, 2018), and for the researcher to obtain

insights into social and educational processes (Onwuegbuzie & Leech, 2004). Interviews are inexpensive and relatively easy to conduct (Corral-Verdugo, 1997). Interviews allow for open-ended questions leading to nuanced understandings and rich narrative descriptions of perceptions from diverse perspectives.

Personal, face-to-face, semi-structured interviews were conducted with an interview sample from the quantitative data collection (Bird, 2009; Creswell, 2009; Fink & Kosecoff, 1998; Ivankova *et al.*, 2006; Newell & Green, 1997). This allowed the researcher to deepen her understanding of the factors that influence people as far as environmental issues are concerned (Bennett, 2016; Bird, 2009; Johnson & Onwuegbuzie, 2004), as well as possibly explain relationships emerging from the quantitative data (Onwuegbuzie & Leech, 2004). Interviews were recorded with verbal consent from the interviewee (Maestre-Andrés *et al.*, 2016; Wolf, Adger, Lorenzoni, Abrahamson & Raine, 2010). Individuals were interviewed by the researcher of this dissertation, in either English or Afrikaans, as preferred by the interviewee.

4.5.1. Questionnaire design

Local perceptions can be determined by interviewing citizens of a specific area and how they view the environment (Kangalawe, 2012). The interview questionnaire was designed on the basis of sequential design, where the data collected in the first phase contributed to the data collected in the second phase (Driscoll, Salib & Rupert, 2007; Whyte, 1977). The questionnaire comprised of questions on environmental perceptions, concern, causes of problems, behaviour and information sources.

The interview schedule consisted of individualised questions intended to explore interesting or vague survey answers as well as general questions to further explore environmental perceptions (Driscoll *et al.*, 2007). The semi-structured questionnaire (Møller *et al.*, 2018) comprised of two pages and 18 questions (Addendum 6), 16 of which were open-ended (Whyte, 1977; Wolf *et al.*, 2010) and two Likert-scale questions (Haq & Ahmed, 2017; Michalos *et al.*, 2009):

1. Please introduce yourself (this was asked to make the interviewee feel more comfortable).
2. Is there anything specific you like about the environment?
3. Do you appreciate spending time outdoors (Barber *et al.*, 2003)?
4. Have you experienced any changes in your surrounding natural environment (Bakuwa, 2015)?
5. Can you name some environmental problems South Africans face (Bakuwa, 2015; Simon, 1971)?
6. Are there any environmental problems you consider a threat to your family (Besley & Shanahan, 2004)?
7. Would you agree that you as a person have a negative impact on the environment (Bakuwa, 2015; Holl *et al.*, 1995)?
8. Are you involved in any pro-environmental/environmentally friendly activities outside your household (Besley & Shanahan, 2004; Klineberg *et al.*, 1998)?
9. How often do you take part in environmentally friendly activities (list provided; Likert-scale) (Besley & Shanahan, 2004; De Lavega, 2004; Query, 2005)?

10. Do you think the environment is important for maintaining the wellbeing of humans and society (Holl *et al.*, 1995)?
11. Do you think South Africans need to worry about the impact of environmental problems on their livelihoods (Bakuwa, 2015)?
12. Do you think the government is spending enough money on the environment (Besley & Shanahan, 2004)?
13. Do you think the government is doing enough to create awareness about the environment (Burns *et al.*, 2003; Swami *et al.*, 2011)?
14. Where do you get your information about the environment (Bakuwa, 2015; Cox, 2013)?
15. Were you educated about the environment during your school years (Alp *et al.*, 2006)?
16. Do you think environmental issues are covered enough in the media (P. R. Brewer & Ley, 2013; Groffman *et al.*, 2010)?
17. Agree or disagree with statements about the environment (list provided; Likert-scale) (Bakuwa, 2015; De Lavega, 2004).
18. Any other comments?

All questions were followed up by an informal discussion (Kovacs, 2000) to examine beliefs relating to the environment (Murch, 1971). These open-ended questions were used to encourage the interviewees to talk about aspects of their lives and experiences with the environment and environmental problems in the form of a narrative (Rogan, O'Connor & Horwitz, 2005). The interview schedule was evaluated by two research staff members at the department of the researcher and was pre-tested on six residents of the Stellenbosch community.

4.5.2. Interview sample

Interviewees were representative from the clusters developed during the quantitative data analysis of the dissertation. Interviewees who indicated (see Addendum 1) that he or she is willing to do a follow-up interview were divided into the four clusters. Interviewees were then selected randomly from the clusters. Interviewees were contacted either via email or telephonically and a date and time for the qualitative interview was set. A total of 15 people (Ballantyne & Oelofse, 1999) from the four different clusters were interviewed. 31 were approached, resulting in a response rate of 48.39%. Cluster 1 had an average response rate; four of the eight interviewees contacted were willing to do a follow-up interview (50% response rate). For cluster 2, seven individuals were contacted and three accepted the invitation for a follow-up interview, resulting in a response rate of 42.86%. Cluster 3 had a response rate of 57.14%; four interviewees out of seven contacted were willing to do a follow-up interview. Nine interviewees from Cluster 4 were contacted, and four were willing to do a follow-up interview, resulting in a 44.44% response rate, the lowest response rate of the four clusters.

All the interviews were conducted by the main researcher, and occurred at the interviewee's residence, place of work, community centres or coffee shops, depending on the interviewees preference (Møller *et al.*, 2018; Rogan *et al.*, 2005). Interviews were conducted during the working week. Each interview lasted between 13

minutes and 45 minutes with an average length of 25.27 minutes ($SD = 9.625$). The responsiveness and interest among the participants ranged from highly engaged to somewhat disinterested. At the start of all interviews, interviewees were informed about their rights (Addendum 7).

4.6. Qualitative data analysis

All interviews were transcribed, translated to English and checked for accuracy (Ballantyne & Oelofse, 1999). These transcripts were then entered into Atlas.ti (version 8.0) where they were read and analysed the researcher. The software was used to perform a thematic analysis and identify common themes in the data (Ballantyne & Oelofse, 1999; Braun & Clarke, 2006; Hayball, McCrorie, Kirk, Gibson & Ellaway, 2018; Kulözü, 2016; Running *et al.*, 2017; Wolf *et al.*, 2010) regarding the different publics' perceptions about the environment. The researcher used Braun and Clarke's (2006) phases of thematic analysis.

Coding is a key step in the process of content analysis (Bakuwa, 2015). This researcher applied an inductive/open-coding approach (determining new codes from the data) (Adams & Savahl, 2015; Rogan *et al.*, 2005; Wolf *et al.*, 2010) to develop a coding manual (Bakuwa, 2015) (Addendum 8). Only one person was selected for the coding analysis and interpretation of the data in order to maximise the validity and reliability of the results (Ballantyne & Oelofse, 1999). The coding manual is a list of instructions for the coder that includes all the possible themes that could be coded (Bakuwa, 2015). It acts as a guide for the coder. Once all the transcripts were coded, codes were selected for themes relating to the research questions (S. Adams & Savahl, 2015; Hayball *et al.*, 2018)

4.6.1. Descriptive statistics

Table 4.3 contains the descriptive statistics of the qualitative population interview sample. Ten men and 5 women were interviewed from various socio-demographic backgrounds, representing individuals from the four clusters. The maximum age was 75, the minimum age was 24 and the mean age was 54.64 years old ($SD = 17.714$). The education of the interview sample ranged from primary school education to one individual having a doctorate degree. The main language of the interview sample was Afrikaans, with 73.3% of the interview sample stating that they speak Afrikaans at home. Three individuals spoke Xhosa at home (20.0%) and only one individual spoke English (6.7%). The largest part of the interview population is retired (40.0%), followed by full-time employment (33.3%), part time-employment (20.0%) and one student (6.7%).

Table 4.3. Socio-demographic characteristics (profile) of the qualitative interview sample

Cluster	Neighbourhood	Gender	Population group	Age	Education	Home language	Employment	Income
1	Cloetesville	Male	Coloured	58	FET	Afrikaans	Full time	R7 0001–R16 500
	Cloetesville	Male	Coloured	56	Primary school	Afrikaans	Full time	-
	Cloetesville	Male	Coloured	60	-	Afrikaans	Full time	-
	Cloetesville	Female	Coloured	-	GET	Afrikaans	Part time	-
2	Kayamandi	Male	African	26	Tertiary	Xhosa	Full time	R4 000–R7 000
	Kayamandi	Male	African	27	High school	Xhosa	Unemployed	0
	Kayamandi	Male	African	60	FET	Xhosa	Retired	R752–R1 500
3	Jonkershoek	Male	White	69	Tertiary	Afrikaans	Retired	R33 001–R57 000
	Jonkershoek	Male	White	60	Tertiary	Afrikaans	Part time	-
	Jonkershoek	Male	White	71	Tertiary	Afrikaans	Retired	R16 501–R33 000
	Onderpapppegaaiberg	Male	White	24	Tertiary	English	Student	R1 501–R4 000
4	Jonkershoek	Female	White	75	Tertiary	Afrikaans	Retired	-
	Jonkershoek	Female	White	72	Tertiary	Afrikaans	Part time	-
	Jamestown	Female	White	42	Tertiary	Afrikaans	Full time	R33 001–R57 000

Chapter 5: The most important environmental issues facing SA, main environmental information sources used and general knowledge about the environment

5.1. Introduction

In this chapter the researcher examines and discusses the first, third and fourth research questions: Stellenbosch citizens' perceptions about the environment and environmental issues, the main information sources used to access information about the environment and the knowledge level of the population.

The first section deals with how the population defined the environment. This is followed by how the sample rank environmental problems in relation to other social problems, followed by how the population ranks environmental problems South Africa might face. This is then followed by a discussion and conclusion. The second section examines what sources are used to access information about the environment and environmental problems. The last section in this chapter the researcher analyses the knowledge levels of the population regarding the environment and environmental problems.

5.2. Results

5.2.1. Defining the environment

The first question in the survey asked respondents to say what comes to mind when they hear the words 'natural environment'. Table 5.1 demonstrates the frequency of themes that were mentioned the most by the respondents ($N = 191$). The themes "natural" or "nature" were mentioned by most respondents from the population ($n = 62$, 35.46%), followed by the theme "vegetation" ($n = 52$, 27.23%) and then "animals" ($n = 27$, 14.14%).

Table 5.1. Frequency of top seven themes that were mentioned by respondents ($N = 191$) regarding what they associate with the natural environment

Themes	Sample size (n)	Percentage (%)
Natural surroundings	62	35.46
Vegetation	52	27.23
Animals	27	14.14
Untouched	17	8.90
Mountains	17	8.90
Water	15	7.85
Living	12	6.28

5.2.2. The ranking of environmental problems in comparison to other South African social problems

Respondents were asked to evaluate how serious they perceive environmental challenges to be in comparison to other social challenges South Africa may be facing (Table 5.2). The findings indicate that environmental problems are not among the top-ranked social problems in South Africa ($M = 3.17$, $SD = 0.79$). In fact,

environmental challenges are considered to be the second least serious social problem. Crime, poverty and corruption, in that order, are seen as the top three most serious social problems South Africans face. Quality of schooling was considered the least serious social problem ($M = 2.94$, $SD = 0.879$). Environmental problems in South Africa is also the social problem that received the most “I don’t know” answers when asked to rank its seriousness: 14.66% of the sample was unable to say how serious environmental problems in South Africa are. Less than half of the population (32.46%) ranked environmental problems as a very serious issue in South Africa (Figure 5.1).

Table 5.2. Comparison of the severity of social challenges and issues in South Africa using a Likert-scale

Social challenge	Mean (<i>M</i>)	Standard deviation (<i>SD</i>)
Crime (<i>n</i> = 190)	3.83	0.40
Poverty (<i>n</i> = 191)	3.78	0.44
Corruption (<i>n</i> = 188)	3.72	0.52
Population growth (<i>n</i> = 187)	3.50	0.73
HIV/AIDS (<i>n</i> = 166)	3.43	0.66
Other diseases (<i>n</i> = 183)	3.21	0.76
Environmental problems (<i>n</i> = 163)	3.17	0.79
Quality of schooling (<i>n</i> = 179)	2.94	0.88

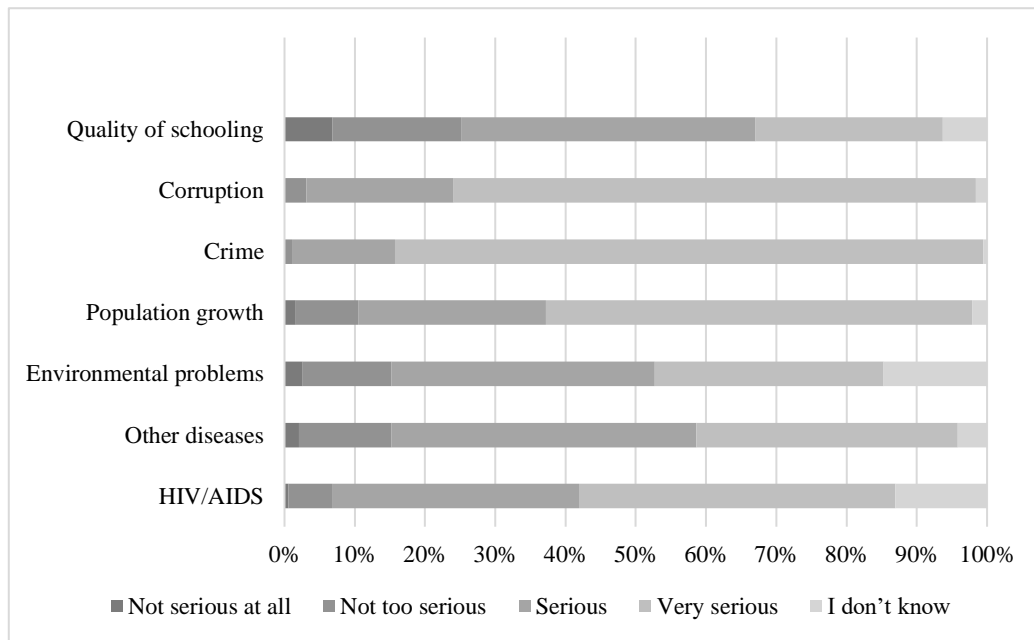


Figure 5.1. Percentage of respondents' answers to Likert-scale questions about the perceived seriousness of South Africa's social problems

5.2.3. Ranking of environmental problems facing South Africa

Using an open-ended question, respondents were asked to state which environmental problem they think is the most serious in South Africa (Table 5.3). Sixty-three individuals (32.98%) indicated a problem involving water and 32 (16.75%) individuals mentioned drought or water scarcity. This is supported by the results of Likert-scale questions that show that water scarcity is seen as the most serious environmental problem in South Africa ($M = 3.54$, $SD = 0.789$) (Table 5.4). This is further supported by the 67.54% of the population indicating that they view water scarcity as a 'very serious' problem (Figure 5.2).

Table 5.3. Frequency of top ten themes that were mentioned by respondents regarding national environmental problems.

Theme	<i>n</i>	%
Water	63.0	32.98
Pollution	40.0	20.94
Drought	32.0	16.75
Overpopulation	17.0	8.90
Climate change	11.0	5.76
Management	9.0	4.71
Poaching	8.0	4.19
Destruction	5.0	2.62

Cutting down trees	4.0	2.09
Carelessness	3.0	1.57

Table 5.4. Comparison of the severity of environmental challenges and issues in South Africa using a Likert-scale

Environmental problem	mean	<i>SD</i>
Water scarcity/drought (<i>n</i> = 191)	3.54	0.79
Climate change (<i>n</i> = 185)	3.39	0.73
Fresh water pollution (<i>n</i> = 188)	3.37	0.79
Terrestrial pollution (<i>n</i> = 179)	3.37	0.70
Habitat destruction (<i>n</i> = 182)	3.16	0.86
Ocean pollution (<i>n</i> = 170)	3.14	0.99
Wildlife poaching (<i>n</i> = 174)	3.14	0.97
Overfishing (<i>n</i> = 174)	3.12	0.89
Species endangerment (<i>n</i> = 169)	3.07	0.89
Solid waste management (<i>n</i> = 188)	3.04	0.98
Invasive species (<i>n</i> = 165)	2.66	0.93

When comparing South African environmental problems, the second most seriously perceived problem is climate change ($M = 3.39$, $SD = 0.731$), followed by fresh water ($M = 3.37$, $SD = 0.793$) and then terrestrial pollution ($M = 3.37$, $SD = 0.702$) (Table 5.4). Climate change was mentioned 11 times (5.76%) and pollution 40 times (20.94%), when respondents were asked what they think the most serious environmental problem in South Africa is (Table 5.3). The occurrence of invasive species in South Africa is considered the least serious environmental problem; 31.42% of the population ranked it as ‘not too serious’ (Figure 5.2), and it was only mentioned by one individual when asked about the environmental problems in South Africa.

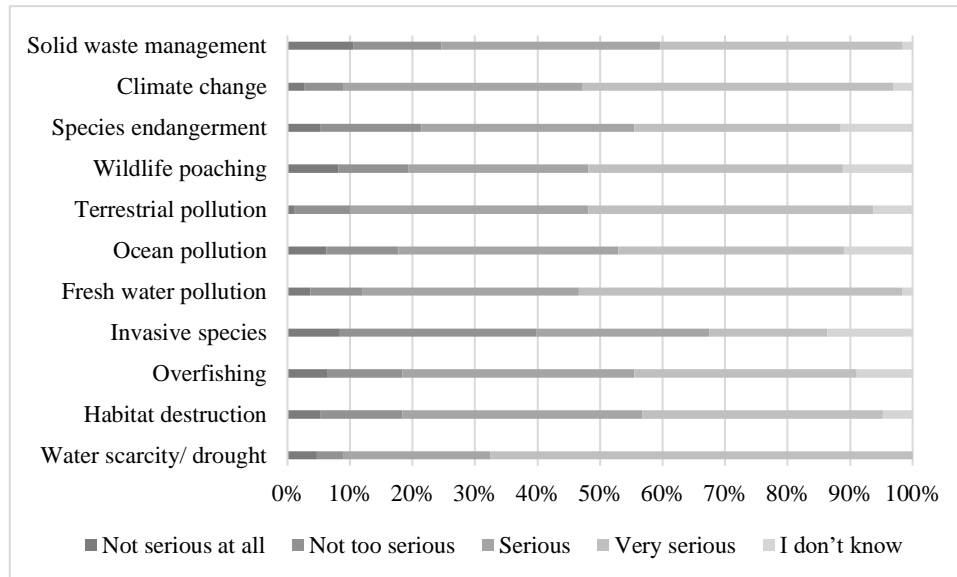


Figure 5.2. Percentage of respondents' answers to Likert-scale questions about the seriousness of South Africa's environmental problems

When comparing what each neighbourhood perceived as the most serious environmental problem in South Africa, three of the four neighbourhoods perceived that water scarcity and/or drought is the most severe environmental problem (Table 5.5). Individuals from the lowest income neighbourhood, Kayamandi, view climate change ($M = 3.10$, $SD = 0.857$) as the most serious environmental problem in South Africa. The middle-income neighbourhood, Onderpapegaaiberg ($M = 3.51$, $SD = 0.62$), view the environmental problems in total as more serious than the other three neighbourhoods. This neighbourhood is also the only one that doesn't view invasive species as the least serious environmental problem, but rather solid waste management ($M = 2.96$, $SD = 0.912$).

Table 5.5. Comparison of the significance of environmental challenges in South Africa in neighbourhoods of different socio-economic statuses

Environmental problem	Onderpappesgaaiberg		Jonkershoek		Kayamandi		Cloetessville	
	mean	<i>SD</i>	mean	<i>SD</i>	mean	<i>SD</i>	mean	<i>SD</i>
Water scarcity/drought (<i>n</i> = 191)	3.81	0.45	3.86	0.401	2.88	1.10	3.65	0.48
Climate change (<i>n</i> = 185)	3.24	0.763	3.65	0.60	3.10	0.86	3.41	0.58
Fresh water pollution (<i>n</i> = 188)	3.35	0.842	3.69	0.47	2.96	0.95	3.48	0.96
Terrestrial pollution (<i>n</i> = 179)	3.17	0.696	3.49	0.62	3.39	0.75	3.41	0.73
Habitat destruction (<i>n</i> = 182)	3.19	0.773	3.33	0.69	2.76	1.05	3.40	0.73
Ocean pollution (<i>n</i> = 170)	3.26	0.701	3.55	0.58	2.55	1.09	3.16	0.83
Wildlife poaching (<i>n</i> = 174)	3.36	0.727	3.53	0.68	2.36	1.25	3.27	0.67
Overfishing (<i>n</i> = 174)	3.33	0.662	3.45	0.72	2.39	1.06	3.32	0.60
Species endangerment (<i>n</i> = 169)	3.16	0.843	3.38	0.71	2.77	1.05	2.91	0.82
Solid waste management (<i>n</i> = 188)	3.09	0.840	2.96	0.91	2.98	1.17	3.13	0.98
Invasive species (<i>n</i> = 165)	2.50	0.893	3.69	0.47	2.36	1.10	2.81	0.81
Total (<i>N</i>)	3.22	0.74	3.51	0.62	2.77	1.04	3.27	0.75

5.2.4. General use of environmental information sources

Television is used the most as a source for environmental information by the population ($M = 2.85$, $SD = 0.959$) (Table 5.6). This is supported by the Likert-scale questions, where more than 50% of the respondents selected

‘often’ and ‘very regularly’ when asked how often they use the television to access environmental information (Figure 5.3). Television is followed by personal sources (friends and family) ($M = 2.65$, $SD = 1.022$) and then newspapers ($M = 2.64$, $SD = 1.010$) (Table 5.6). NGOs are ranked lowest on the list of information sources used by the sample and more than 50% of the sample stated that they ‘never’ use NGOs to receive information about the environment (Figure 5.3).

Table 5.6. Comparison of sources used to get information about the environment and environmental problems using a Likert-scale

Environmental problem	mean	<i>SD</i>
Television (<i>n</i> = 175)	2.85	0.959
Personal sources (<i>n</i> = 187)	2.65	1.022
Newspapers (<i>n</i> = 184)	2.64	1.010
Online sources (<i>n</i> = 179)	2.56	1.147
Radio (<i>n</i> = 175)	2.56	1.086
Magazines (<i>n</i> = 187)	2.37	0.983
Books (<i>n</i> = 168)	2.21	1.055
National campaigns, political sources (<i>n</i> = 185)	1.82	0.888
Formal sources (<i>n</i> = 182)	1.68	0.859
NGOs (<i>n</i> = 182)	1.66	0.931

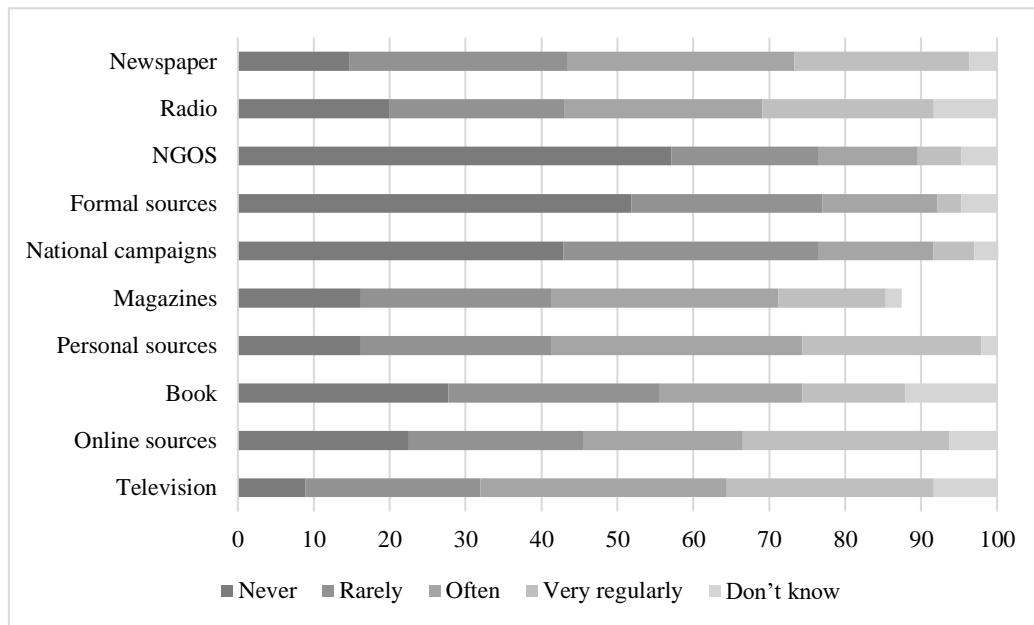


Figure 5.3. Percentage of respondents' answers to Likert-scale questions on how often they use various sources to access environmental information

5.2.5. General environmental knowledge

Respondents ($N = 191$) were asked to rate their own knowledge (self-measured) about the environment. Of the total sample 9.4% claimed that they have a lot of knowledge about the environment and environmental issues; 5.2% stated that they have none to only a little bit of knowledge about the environment. The majority of the sample (50.3%) ranked their knowledge about environmental problems as 'reasonably well informed' ($M = 2.65$, $SD = 0.727$).

Results testing the sample's actual knowledge reveal that on average, .82.30% ($M = 157.2$, $SD = 20.595$) is the average percentage of respondents) who answered the true-or-false questions about environmental topics correctly (Table 5.7). More than 50% of the population had extremely high knowledge of the environment (Group 4, Table 5.8), based on the questions asked. Only four respondents (2.09%) had low knowledge levels (Group 1, Table 5.8).

The most correct answers were for the true-or-false statement "Rhinos are hunted for their horns", with 95% ($n = 181$) of the population agreeing with it (Table 5.7). The true-or-false statement most of the population got wrong is "Fossil fuels provide most of South Africa's energy/electricity" ($n = 72$, 37.96%) (Table 5.9). It is also this statement that had the most 'I don't know' answers ($n = 39$, 20.41%), followed by the statements: "Carbon dioxide does not contribute to climate change in Africa" ($n = 26$, 13.6%).' and 'Fynbos grows everywhere in South Africa' ($n = 26$, 13.6%) (Table 5.9).

Table 5.7. Frequency and percentage of respondents who answered true-or-false questions about environmental topics correctly ($N = 191$)

Environmental topic	<i>n</i>	Percentage (%)
Poaching	181	94.76
Ecological balance	179	93.72
Global warming	172	90.05
Climate change and forest destruction	169	88.48
Renewable energy	165	86.39
Natural resources	164	85.86
Pollution	163	85.34
Recycling	159	83.24
Climate change and CO ₂	135	70.68
Fynbos	123	64.40
Fossil fuels	119	62.30
Average	157.2 (<i>SD</i> = 20.595)	82.30

Table 5.8. Respondent groupings regarding their knowledge about the environment

	Group 1: low knowledge level	Group 2: intermediate knowledge level	Group 3: high knowledge level	Group 4: extremely high knowledge level	
	1–3 correct answers	4–6 correct answers	7–9 correct answers	10–11 correct answers	Total
Frequency	4	15	73	99	191
Percent	2.09	7.85	38.22	51.83	100

Table 5.9. Frequency and percentage of respondents who were unable to answer the true-or-false questions about environmental topics ($N = 191$)

Environmental topic	<i>n</i>	Percentage (%)
Fossil fuels	39	20.41
Climate change and CO ₂	26	13.61
Fynbos	26	13.61
Renewable energy	20	10.47
Climate change and forest destruction	14	7.33
Global warming	9	4.71
Natural resources	8	4.19
Recycling	8	4.19
Ecological balance	7	3.33
Poaching	5	2.62
Pollution	5	2.62
Average	15.18 ($SD = 11.143$)	7.95

5.2.6. The relationship between environmental knowledge and information sources

A correlation analysis revealed five significant relationships between the knowledge index and various environmental information sources (Table 5.10): online sources, books, personal sources, magazines and newspapers. The strongest relationship is between book use and environmental knowledge.

Table 5.10. Correlation between environmental knowledge and various information sources

Information source	Pearson correlation coefficient
Television	-0.01
Online sources	0.25*
Books	0.31*
Personal sources	0.23*
Magazines	0.26*
National campaigns	0.07
Formal sources	-0.08
NGOs	-0.02
Radio	0.10
Newspapers	0.22*

*significant for $p < 0.05$

5.3. Discussion

5.3.1. Defining the environment

The first question examined how individuals perceive the “natural environment”, as the environment holds different connotations and different contexts for different people. The results indicated that the residents of the town are able to identify with certain aspects of nature and the natural environment.

Overall, respondents’ perceptions of the natural environment showed that they understood it in terms of three main themes: nature or natural surroundings, vegetation and animals. The description of natural surroundings included terms such as surrounding green areas and neighbourhood parks. Vegetation was described by words like grass, plants and flowers and the animal theme was described by mentioning animals in general and specific kinds of animals and birds.

The environment is a concept that exists and takes on meaning in relation to the being whose environment it is (Ingold, 2000). It seems that the population view the environment as how they observe it in the town they live in, parks in their communities, and plants and urban animals that can be found in and around the town.

5.3.2. The ranking of environmental problems in comparison to other South African social problems.

The results indicate that environmental challenges and problems are not perceived as a high priority social challenges in South Africa. Similar results were observed in Ghana, another developing country in Africa. Results of a survey of Ghanaian citizens reveal that they have more concern for other social issues in comparison to environmental issues (White & Hunter, 2009). These findings were also previously observed in the USA during January 1996, where environmental problems ranked 14th out of 15 national problems (Ladd & Bowman, 1996).

The only problem seen as less serious than environmental problems is low quality of schooling. The three problems of highest priority, in decreasing order, are crime, poverty and corruption. Poverty, crime, unemployment and inequality still remain some of South Africa’s most significant social challenges (Cilliers & Aucoin, 2016; Philip, Tsedu & Zwane, 2014). South Africa remains one of the countries in the world with the highest levels of income inequality (The World Bank, 2006). More than half of South Africans (30.4 million individuals, or 55.5%) were poor in 2015 (Lehohla, 2017). South Africa also has exceptionally high levels of violent crime (CSVR, 2009). Mismanagement and maladministration at local and national governments in South Africa, mean that corruption levels are still high (Cilliers & Aucoin, 2016; National Planning Commission, 2011). These problems being so severe, influencing individuals directly and indirectly, may result in environmental problems taking a back seat on the national agenda.

5.3.3. The ranking of environmental problems in South Africa

Of the local environmental problems that South Africa faces, the population stated that water scarcity and/or drought, climate change, and fresh water and terrestrial pollution are perceived as the most serious/important problems. The threat of invasive species is viewed as the least serious problem.

South Africa is a relatively dry country, and at the time of the research and data collection (2016–2018), the Western Cape was suffering extreme water shortages as a result of a severe drought. The water sources in the Western Cape were under pressure due to abnormally high temperatures in November and December 2015 (Balzer, 2016). On 23 October 2017, the City of Cape Town stated that the dams that provide water to the Western Cape were at 38.5% of which only about 28.5% can be used (City of Cape Town, 2017). Citizens from the Western Cape, including Stellenbosch were made aware of this problem and ways to control it through various media sources and governmental campaigns, resulting in high awareness of this problem.

Climate change is currently one of the most critical global environmental problems (Takahashi & Selfa, 2015), and therefore it is unsurprising that climate change was considered as the second most serious environmental problem by the population. This result is similar to those of surveys done across the member states of the EU between 2009 and 2013 (Capstick, Whitmarsh, Poortinga, Pidgeon & Upham, 2015). When individuals were allowed to select more than one environmental issue, approximately half of respondents consistently considered global climate change to be among the most severe environmental problems facing the world (Capstick *et al.*, 2015).

Media depictions of climate change are a vital source of information for many individuals, citizens and stakeholders alike (Schäfer & Schlichting, 2014). Communication can create awareness about climate change (Metag, Füchslin & Schäfer, 2017) and climate change was often in the news media during the second half of 2017 due to President Donald Trump's withdrawal from the Paris agreement and hurricanes Harvey, Irma and Maria. Because climate change is an abstract, complex issue, and not directly perceivable, people's perceptions are mostly based on information the media provides, or interpersonal communication (Metag *et al.*, 2017).

Climate change is also a global environmental problem, and it has been shown that people rank the importance of global environmental issues as significantly higher than national or local environmental issues (Holl *et al.*, 1995). Individuals' perceptions of temperature anomalies can also influence perceptions of climate change. Even though there are important distinctions between 'weather' and 'climate change', 'weather' is strongly associated with 'climate' by non-experts and current weather patterns may be used, consciously or not, to make assumptions about the legitimacy of climate change (Capstick *et al.*, 2015). With the drought in the Western Cape it is plausible that the changing meteorological conditions are influencing how serious the respondents perceive climate change.

Similar to the general view of the most serious environmental problems, the four different neighbourhoods viewed water scarcity and climate change as the most serious environmental problems. However, the lowest income group did view climate change as more serious than water scarcity. One possible reason for this could be that the severity of water scarcity does not reach the lowest income neighbourhood due to a lack of service provision and environmental communication in these neighbourhoods.

5.3.4. General use of environmental information sources

It is very likely that individuals rely on the media to acquire information about the environment and environmental issues (Kolandai-Matchett, 2009). Television is used the most to access information about the environment, followed in order by, personal sources (not a media source), newspapers, and online sources and radio. Many public opinion surveys reveal similar results: that television, newspapers, online sources and radio are used as primary sources of information (Boykoff, 2009; Sampei & Aoyagi-Usui, 2009; Thaker *et al.*, 2017). Television, the Internet, and newspapers might be used the most, because they are most likely to be the easiest and quickest ways to get educated about environmental issues in a person's daily routine (O'Brien, 2007).

The high levels of television viewing for environmental information is not surprising. According to the 2011 Census, of the 14.5 million homes in South Africa, almost 10.7 million own a television (73.79%) (SAPA, 2012). There are more than 37.1 million adult television viewers in South Africa in 2017 (BRC, 2017b). It has been calculated that the total number of South African households who own a television will grow 10% from end-2015 to end-2018 to a total number of almost 13.3 million households (Screen Africa, 2015). A social survey also say that 80.2% of Stellenbosch citizens own or have access to a television (Naidoo, 2005).

This high television use to access environmental information could be due to the dramatization of environmental stories covered by television media (Holbert *et al.*, 2003). Even with sporadic and overly dramatic reporting of the environment and environmental issues on television, it has had a positive influence in creating a greater desire within individuals to act more environmentally friendly (Holbert *et al.*, 2003). In Europe, and the USA also, individuals report high levels of trust in the television as a source of information concerning the environment (Brewer & Ley, 2013; Buckley *et al.*, 2017). Additionally, a positive relationship has been observed between news coverage of environmental issues and a person's knowledge and attitudes about the subject matter (Holbert *et al.*, 2003).

Personal sources, as a source of information about the environment, have not been included in many past studies. The result here showed that this is the second most used environmental information source. A reason for this could be because individuals rely on interpersonal communication (Bun Lee, 2008) and find it easy to talk to friends and family in an informal way or setting about the environment and environmental problems. It has been suggested that environmentally concerned individuals display higher levels of civic and online engagement and these activities require more interpersonal communication (Nelms, Allen, Craig & Riggs, 2017). Newspaper is used the third most by the sample to access environmental information. This is similar to results in other developing countries, where newspapers have been one of the main sources of science and environmental information (Dasgupta *et al.*, 2000; Nisbet *et al.*, 2002).

In 2013 in South Africa there were 22 daily and 25 weekly major urban newspapers in circulation (Brand South Africa, 2013). Roughly 10.5 million South Africans read the urban daily newspapers in 2013, with about 50% of all South African adults reading newspapers (Brand South Africa, 2013). This high readership could explain why many South Africans are dependent on newspapers for environmental information. Newspapers report on what is new and the most current (Wakefield & Elliott, 2003). Reading newspapers also seems to

encourage relevant positive environmental behaviour (Arendt & Matthes, 2016; Besley & Shanahan, 2004; Ostman & Parker, 1987).

Online sources and radio are fourth on the list of sources of environmental information. The use of online sources to access information about the environment is relatively low, considering that more than 40% of South Africans have access to the Internet (World Wide Worx, 2017) and that online social media have become a key communication channel in today's society (Carducci *et al.*, 2017). The use of radio to gain information about the environment is also low, as more than 87% of the South African population listens to the radio (Mqadi, 2015).

Last on the list, in order from used more to less, are national campaigns, formal sources and NGOs. National campaigns are considered programmes initiated by the government, formal sources included workshops, seminars and conferences and NGOs included community programmes.

The minimal use of national campaigns, formal sources and NGOs for environmental information are similar to a study done previously in South Africa where few individuals indicated that they participate in formal environmental education programmes, but that they instead got their information from newspapers, radio and television programmes (Willers, 1996).

5.3.5. General environmental knowledge

In the simplest of terms, environmental knowledge comprises of what people know about the environment and the main actor leading to impacts on the environment (Fryxell & Lo, 2003). It has been said that knowledge about the environment and environmental problems contribute to peoples' understanding of environmentalism within developing nations (Hunter *et al.*, 2010). The environmental knowledge of a population is also useful in evaluating the effectiveness of environmental communication and education in a nation. One question was listed in the survey to assess a respondent's self-reported knowledge about the environment (Cheung *et al.*, 2015). The majority of the population claimed that they were 'reasonably well informed' about the environment. These results are similar to findings in Hong Kong, 2015, where only a small percentage of the population stated that they either had very little knowledge or a lot of knowledge about the environment (Cheung *et al.*, 2015). However, when it comes to self-evaluation of environmental knowledge many Americans believe they know more about the environment than they actually do (Coyle, 2005; O'Brien, 2007). It is important to note that general self-assessments of knowledge may be inaccurate, as some individuals may want to seem more knowledgeable or even be humble about their stated understanding of the environment (Malka *et al.*, 2009).

Nonetheless, the results of the study indicate that the population sample has a relatively high level of knowledge, regarding information about the environment and environmental problems. Although these questions are not a true representation of an individual's knowledge, it gives a fair idea of what part of the population is more knowledgeable.

However, these results showed the population's knowledge as higher than data from the *South African Social Attitudes Survey* 2013 (SASAS), where 70% of South African's had little to no knowledge about the environmental problems (Reddy, Juan, Hannan, Arends, Gastrow & Roberts, 2013). One explanation for this high knowledge of the population could be that the knowledge questions not only covered environmental problems, but also general knowledge about the environment. Another explanation could be that more than 50% ($n = 97$, 50.8%) of the sample have either a high school or higher academic qualification and are probably more likely to be exposed to sources and other discussions of environmental issues.

The questions about poaching, ecological balance and global warming were answered the best by the sample, suggesting that these might be three issues that the population knows most about. Poaching and global warming, as global environmental issues, are frequently in the news, which could be a reason for the high number of correct answers for these questions. The respondents' knowledge about fynbos and fossil fuels were limited, a surprising finding despite fynbos being the dominant vegetation in the Western Cape, South Africa. Low knowledge of fynbos has been found previously in South Africa (Turpie, 2003).

There is also a correlation between knowledge of the environment and sources used to gain information about the environment. Online sources, books, personal sources and newspapers were all significantly correlated with knowledge about the environment.

5.4. Conclusions

Answering the first research question, the Stellenbosch public has a good perception of what the environment is and seems well informed about the environment, even though environmental problems are not considered as an important social problem in South Africa. Research question three asked what sources the public used most to access information about the environment. The research indicated that they predominantly use television to access information about the environment. Self-assessed knowledge of the population was relatively high, with majority of the respondents indicating that they are reasonably well informed about the environment. The respondents' measured knowledge was also relatively high when answering research question four.

Chapter 6: The influence of socio-demographic variables on environmental perceptions, environmental information sources and environmental knowledge

6.1. Introduction

In the following chapter the researcher explains and discusses the findings of RQ2, 3 and 4. Five socio-demographic variables influenced the information sources used by the population and three socio-demographic variables influenced the knowledge level of the population. Four socio-demographic variables influenced how serious the respondents perceive environmental problems.

6.2. Results

6.2.1. Socio-demographic variable influences and information sources, knowledge and perceptions of environmental challenges

6.2.1.1. Gender

Gender does not correlate with the sources used by an individual to get information about the environment and environmental problems. It also does not influence the level of knowledge individuals have about environmental issues.

Gender, however, does correlate with how serious the population perceived three of the eleven environmental problems: ocean pollution, endangered species and climate change. In all three cases, females perceived these problems as more serious than males (Table 6.1).

Table 6.1. Gender: seriousness (*m*) of environmental problems

Gender	Ocean pollution (<i>n</i> = 191)	Endangered species (<i>n</i> = 191)	Climate change (<i>n</i> = 191)
Male	2.47	2.53	3.15
Female	3.17	2.94	3.45

Testing the sample for differences between genders, regarding their perception of ocean pollution as an environmental problem, revealed that females ($M = 3.17$, $SD = 1.070$) perceived it as a more serious problem than males ($M = 2.47$, $SD = 1.386$) ($t(189) = -3.855$, $p < 0.05$) (Table 6.1). More females ($n = 41$, 47.13%) than males ($n = 28$, 26.92%) considered ocean pollution as a ‘very serious’ problem. Similarly, more females than males consider ocean pollution as a ‘serious’ problem ($n = 32$, 36.78) (Figure 6.1).

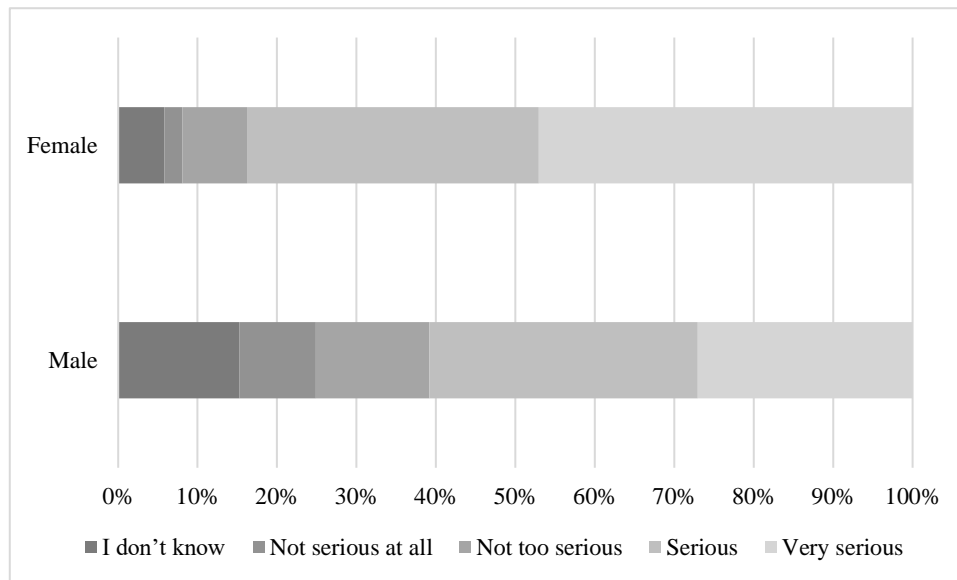


Figure 6.1. Gender: perceived seriousness of ocean pollution as an environmental problem

The results in Table 6.1 also indicate that females ($M = 2.94$, $SD = 1.225$) view endangered species as a more serious environmental problem than males ($M = 2.53$, $SD = 1.322$) ($t(189) = -2.228$, $p < 0.05$). More than 70% of the female sample indicated that endangerment of species is either a ‘very serious’ ($n = 34$, 39.53%) or a ‘serious’ environmental problem ($n = 34$, 39.53%), whereas less than 60% of the male sample stated they saw it as either a “very serious” ($n = 30$, 28.57%) or a “serious” problem ($n = 31$, 29.52) (Figure 6.2). A larger sample of men also stated that it is not serious at all ($n = 24$, 22.86%).

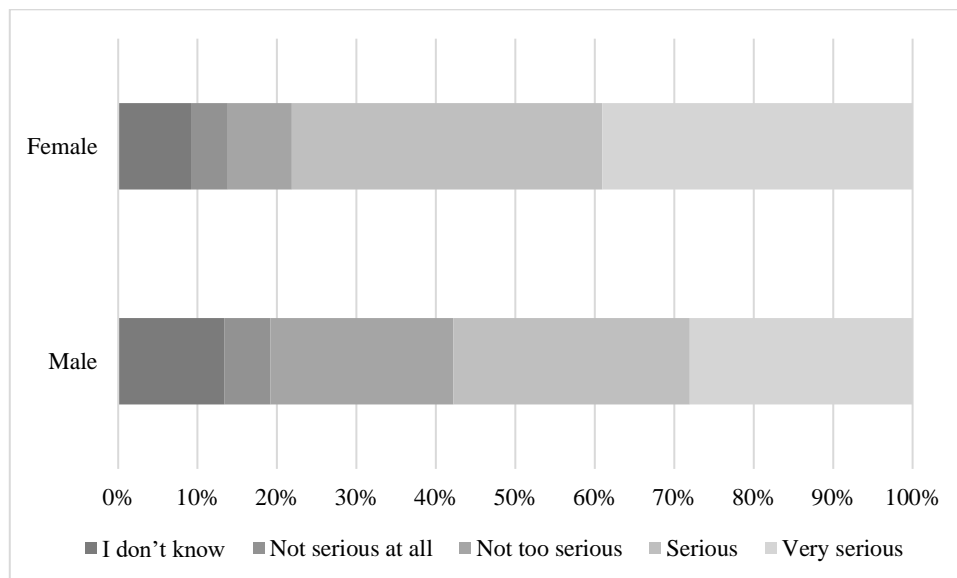


Figure 6.2. Gender: perceived seriousness of endangered species as an environmental problem

Analysing the sample for differences amongst genders, regarding the seriousness of climate change as an environmental problem, also indicated that females ($M = 3.45$, $SD = 0.806$) view it as much more serious than males ($M = 3.15$, $SD = 1.011$) ($t(189) = -2.083$, $p < 0.05$) (Table 6.1).

6.2.1.2. Population group

Examining the results for differences of environmental information source used by various population groups indicated that the population group an individual belongs to correlated with the use of six environmental information sources (Table 6.2).

Table 6.2. Population group: use of various sources (*m*) to access environmental information

Population group	Television (<i>n</i> = 190)	Online sources (<i>n</i> = 190)	Books (<i>n</i> = 190)	National campaigns (<i>n</i> = 190)	Formal sources (<i>n</i> = 190)	Radio (<i>n</i> = 190)
African	3.20 ^b	2.26 ^{ab}	2.00 ^b	2.08 ^b	1.98 ^a	2.76 ^b
White	2.48 ^a	2.70 ^b	2.19 ^b	1.67 ^a	1.39 ^b	2.29 ^a
Coloured	2.24 ^a	2.06 ^a	1.45 ^a	1.61 ^a	1.61 ^a	2.02 ^a

^{a, b, c} Post Hoc test results

There is a difference regarding the use of television as an environmental information source for different population groups (Table 6.2). African individuals ($M = 3.20$, $SD = 0.833$) are most likely to use television as an environmental information source. This is followed by the white population ($M = 2.48$, $SD = 1.149$) and then the coloured population ($M = 2.24$, $SD = 1.423$) ($F(190) = 9.667$, $df = 2$, $p < 0.05$).

There is also a significant difference in the use of online sources to get access to environmental information between population groups ($F(190) = 4.729$, $df = 2$, $p < 0.05$) (Table 6.2). White individuals ($M = 2.70$, $SD = 1.181$) used online sources significantly more than African users ($M = 2.26$, $SD = 1.226$). Thirty white respondents (35.29%) stated that they use online resources “very regularly”, in comparison to only 11 coloured and 11 African respondents (Figure 6.3). African individuals ($n = 18$, 36.73%) also stated that they “never” use online resources to get environmental information, which was more than the other population groups.

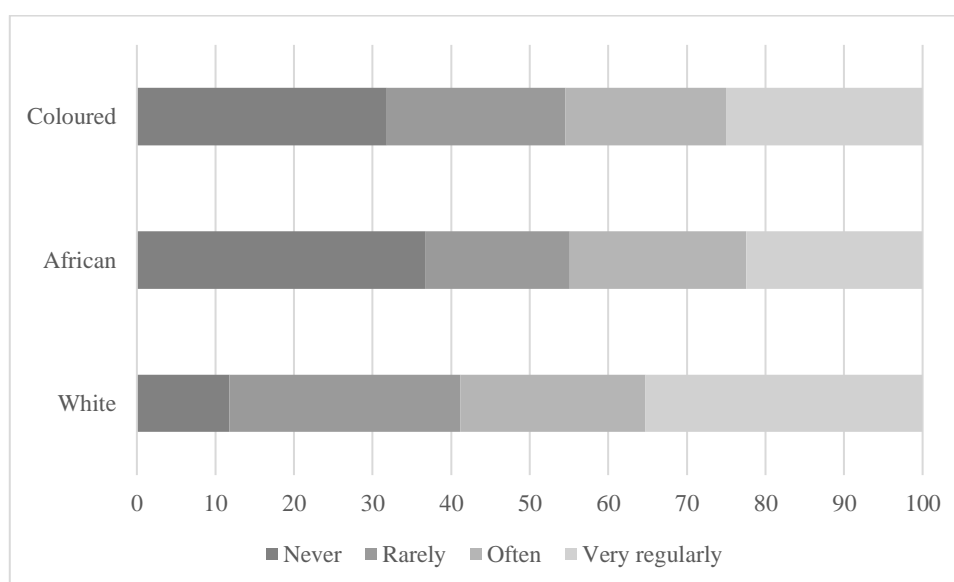


Figure 6.3. Population group: online source use to access environmental information

Analysing the sample for differences among population groups, regarding the use of books as a source of environmental information, revealed that white ($M = 2.19$, $SD = 1.137$) and African ($M = 2.00$, $SD = 1.245$) individuals are more likely than coloured individuals ($M = 1.45$, $SD = 1.238$) to use books to get information about the environment ($F(190) = 6.312$, $df = 2$, $p < 0.05$) (Table 6.2). There is no significant difference between the white and African population.

The results in Table 6.2 indicate that there is a difference between the African population ($M = 2.08$, $SD = 0.966$), and the white ($M = 1.67$, $SD = 0.876$) and coloured ($M = 1.61$, $SD = 0.940$) populations in the use of national campaigns for information about the environment ($F(190) = 4.132$, $df = 2$, $p < 0.05$). African individuals use national campaigns more than the other population groups to get informed about the environment.

The results also indicate that there is a difference between the African ($M = 1.98$, $SD = 1.020$) and coloured ($M = 1.61$, $SD = 0.981$) populations, and the white population ($M = 1.39$, $SD = 0.733$) in the use of formal sources for information about the environment ($F(190) = 7.040$, $df = 2$, $p < 0.05$) (Table 6.2). African individuals use formal sources more than the other population groups for environmental information.

There is a difference between population groups in the use of radio as a source for environmental information. The African population ($M = 2.76$, $SD = 1.349$), and the white ($M = 2.29$, $SD = 1.057$) and coloured ($M = 2.02$, $SD = 1.407$) populations vary in their use of radio for environmental information ($F(190) = 4.653$, $df = 2$, $p < 0.05$) (Table 6.2). Twenty-one African individuals ($n = 21$, 45.65%) in the sample stated that they use the radio “very regularly” (Figure 6.4). Only 15.9% ($n = 14$) of white individuals use it “very regularly” for information about the environment.

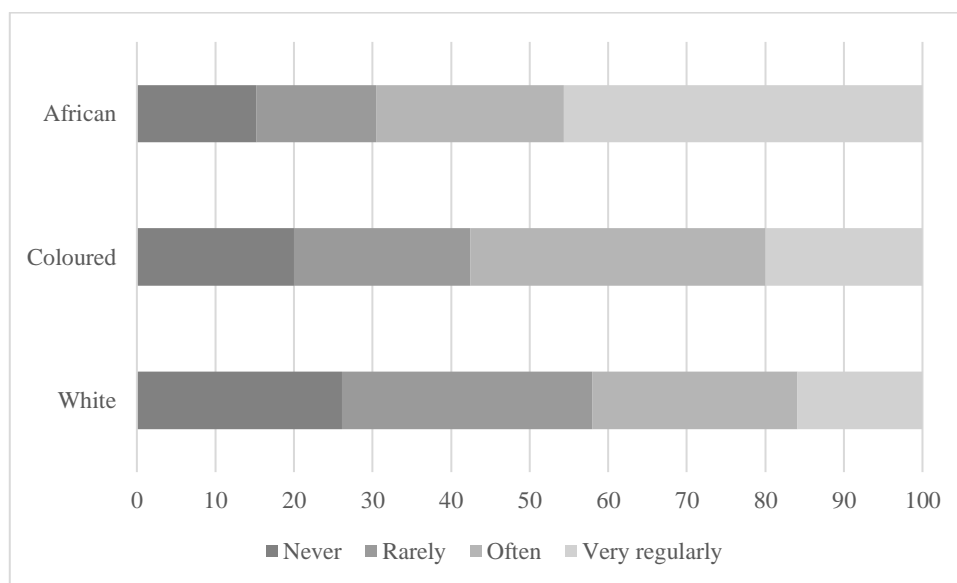


Figure 6.4. Radio use to access environmental information

When comparing different population groups and how many of the questions they answered correctly about the environment and environmental problems (environmental knowledge), differences were found (Table 6.3).

The white population ($M = 10.0674$, $SD = 1.3467$) answered more questions correctly than the coloured population ($M = 8.6078$, $SD = 2.1362$), who, in turn, answered more questions correctly than the African population ($M = 7.7200$, $SD = 1.9064$) ($F(190) = 31.484$, $df = 2$, $p < 0.05$).

Table 6.3. Population group: knowledge (m) about the environment

Population group	Knowledge questions ($n = 190$)
African	7.72 ^a
Coloured	8.61 ^b
White	10.06 ^c

The population group an individual belonged to potentially influenced the perception of eight of the 11 environmental problems, regarding how serious they are perceived (Table 6.4). The white sample of the population perceived all eleven environmental problems as more serious than the coloured and/or African population.

Table 6.4. Population group: seriousness (m) of environmental problems

Population group	Water scarcity ($n = 190$)	Habitat destruction ($n = 190$)	Overfishing ($n = 190$)	Fresh water pollution ($n = 190$)
African	2.90 ^a	2.68 ^a	2.10 ^a	2.96 ^a
Coloured	3.63 ^b	2.90 ^{ab}	3.00 ^b	3.22 ^a
White	3.85 ^b	3.26 ^b	3.17 ^b	3.56 ^b
Population group	Ocean pollution ($n = 190$)	Wildlife poaching ($n = 190$)	Endangered species ($n = 190$)	Climate change ($n = 190$)
Coloured	2.24 ^a	2.73 ^b	2.14 ^a	2.98 ^a
African	2.39 ^a	1.96 ^a	2.42 ^a	3.25 ^{ab}
White	3.31 ^b	3.44 ^c	3.21 ^b	3.48 ^b

Testing the difference between population groups and their view of water scarcity as an environmental problem, indicated that the white and coloured communities view it as a more serious problem than the African community ($F(190) = 31.665$, $df = 4$, $p < 0.05$) (Table 6.4). More than 80% ($n = 77$) of the white sample stated that water scarcity is a ‘very serious’ problem, with the coloured population coming in second ($n = 33$, 64.71%) and the African population last ($n = 19$, 38%). Eighteen percent ($n = 9$) of the African population consider the environmental problem of water scarcity as “not serious at all” (Figure 6.5).

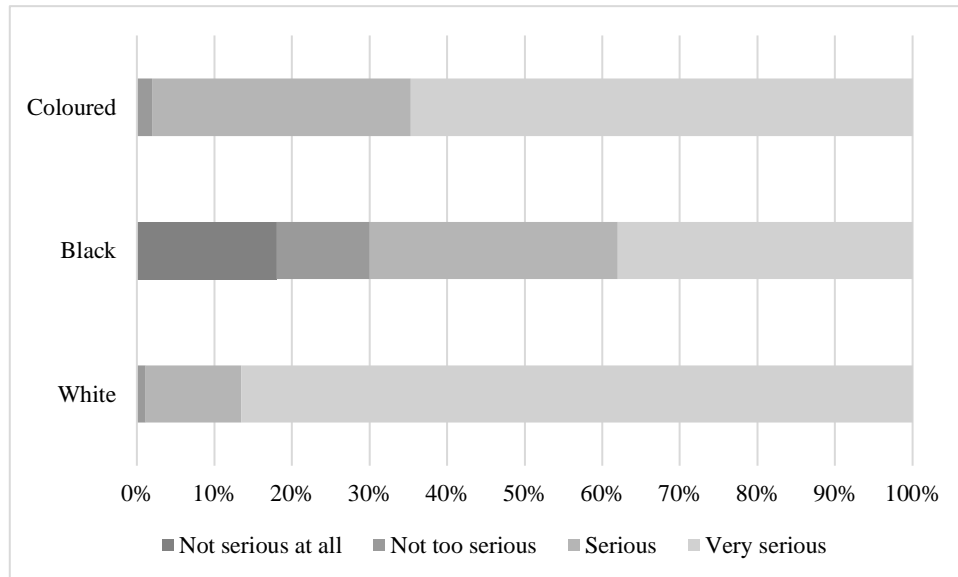


Figure 6.5. Population group: perceived seriousness of water scarcity as an environmental problem

Analysing the difference among population groups and how serious they perceive the destruction of natural habitats is as an environmental problem, results showed that there is a difference between the different population groups ($F(190) = 5.173$, $df = 2$, $p < 0.05$) (Table 6.4). The white population view it as a more serious problem than the African part of the sample. A total of 38 white (43.18%) and 24 coloured respondents (54.55%) stated that they view destruction of natural habitats as a “very serious” problem, in comparison to only 12 African individuals (24.49%) (Figure 6.6).

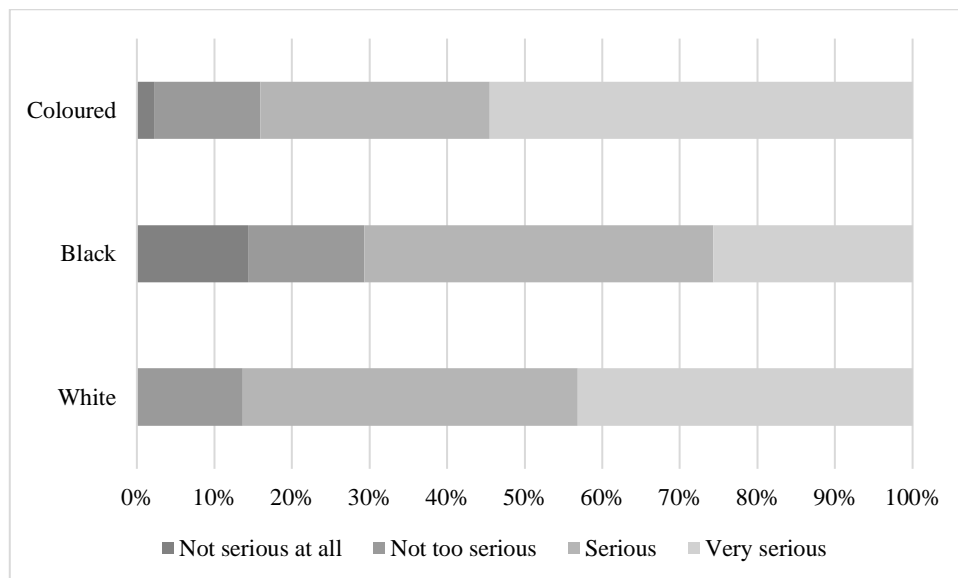


Figure 6.6. Population group: perceived seriousness of habitat destruction as an environmental problem

The results indicated that there is a significant difference between how serious different population groups perceive overfishing as an environmental issue ($F(190) = 14.380$, $df = 2$, $p < 0.05$) (Table 6.4). The white and

coloured populations view overfishing as a much more serious problem than the African population. Supporting these findings, 51.8% of the white population, ($n = 43$) stated that overfishing is a ‘very serious’ problem (Figure 6.7).

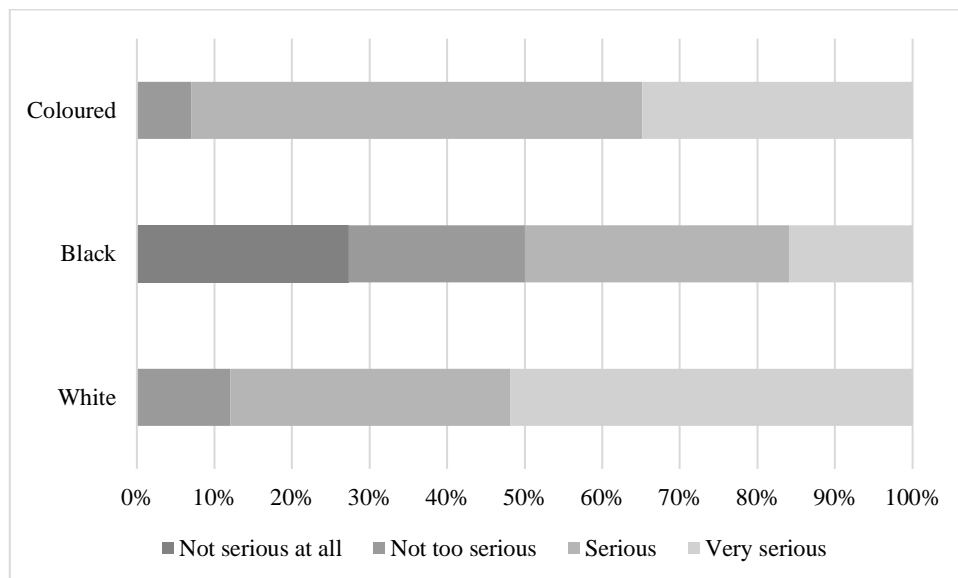


Figure 6.7. Population group: perceived seriousness of overfishing as an environmental problem

Testing the sample for differences among population groups, regarding how serious fresh water pollution is perceived as an environmental problem, showed that the white part of the sample view fresh water pollution as a more serious problem than the other population groups ($F(190) = 8.253$, $df = 2$, $p < 0.05$) (Table 6.4). More than 50% ($n = 56$, 62.92%) of the white sample stated that fresh water pollution is a “very serious” problem, compared to 32% ($n = 16$) of the coloured sample and 54.17% ($n = 26$) of the African sample (Figure 6.8).

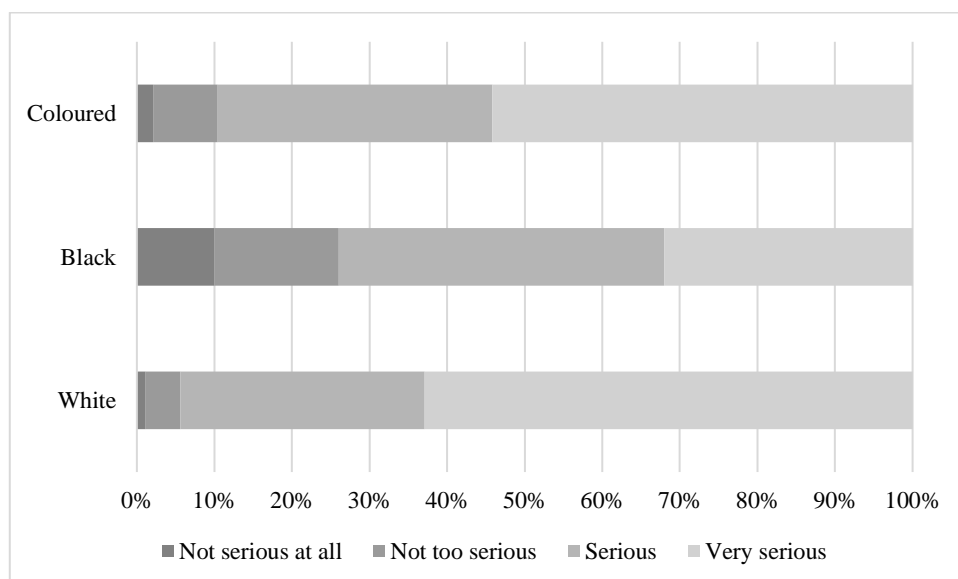


Figure 6.8. Population group: perceived seriousness of fresh water pollution as an environmental problem

The results indicated that there is a significant difference between various population groups and their perception of ocean pollution as an environmental problem ($F(190) = 16.383$, $df = 2$, $p < 0.05$) (Table 6.4). White respondents perceived ocean pollution as more serious than both the coloured and African parts of the population. More than 50% ($n = 44$, 51.16%) of the white sample stated that ocean pollution is a “very serious” problem (Figure 6.9). This is significantly more than the 41.67% ($n = 15$) of the coloured sample and 20.45% ($n = 9$) of the African sample.

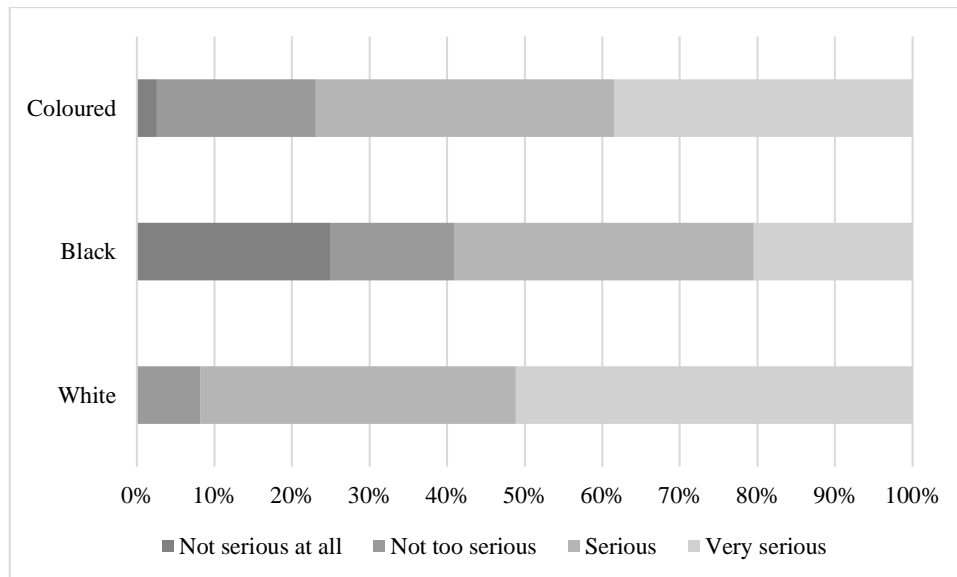


Figure 6.9. Population group: perceived seriousness of ocean pollution as an environmental problem

There is a distinction in how serious wildlife poaching is perceived as an environmental problem by different population groups in the sample ($F(190) = 27.501$, $df = 2$, $p < 0.05$) (Table 6.4). White respondents perceive wildlife poaching as more serious than the coloured population group. Coloured respondents view it as more serious than African respondents. More than 50% ($n = 52$, 59.09%) of the white sample also stated that wildlife poaching as a “very serious” problem, in comparison to only 34.88% ($n = 15$) of the coloured sample and 26.19% ($n = 11$) of the African sample (Figure 6.10).

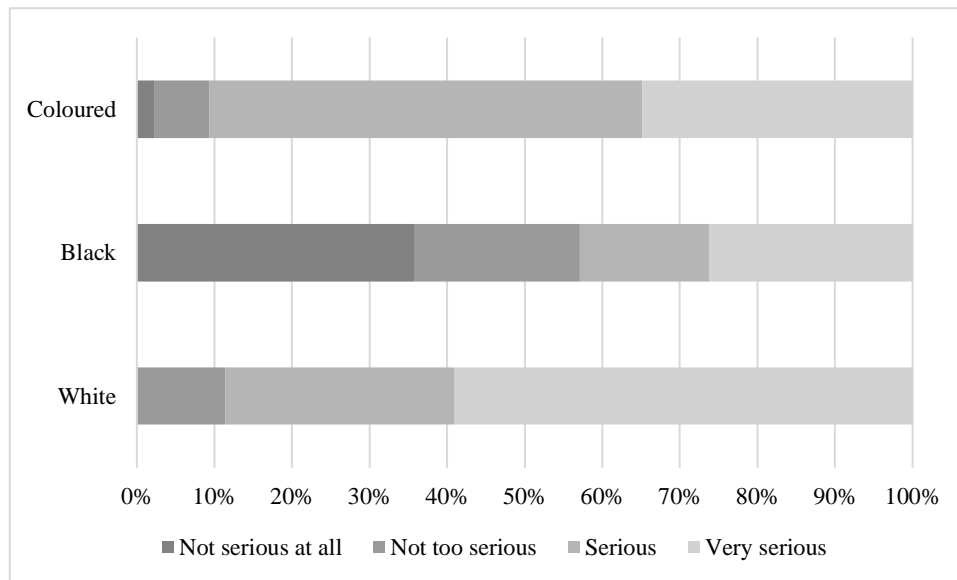


Figure 6.10. Population group: perceived seriousness of wildlife poaching as an environmental problem

Analysing the sample for differences among population groups regarding the seriousness of endangered species as an environmental problem, indicates that white individuals are more likely to see endangered species as a serious environmental problem compared to the other population groups ($F(190) = 4.104$, $df = 140$, $p < 0.05$) (Table 6.4). More than 40% ($n = 41$, 47.13%) of the white sample stated that endangered species is a “very serious” problem (Figure 6.11).

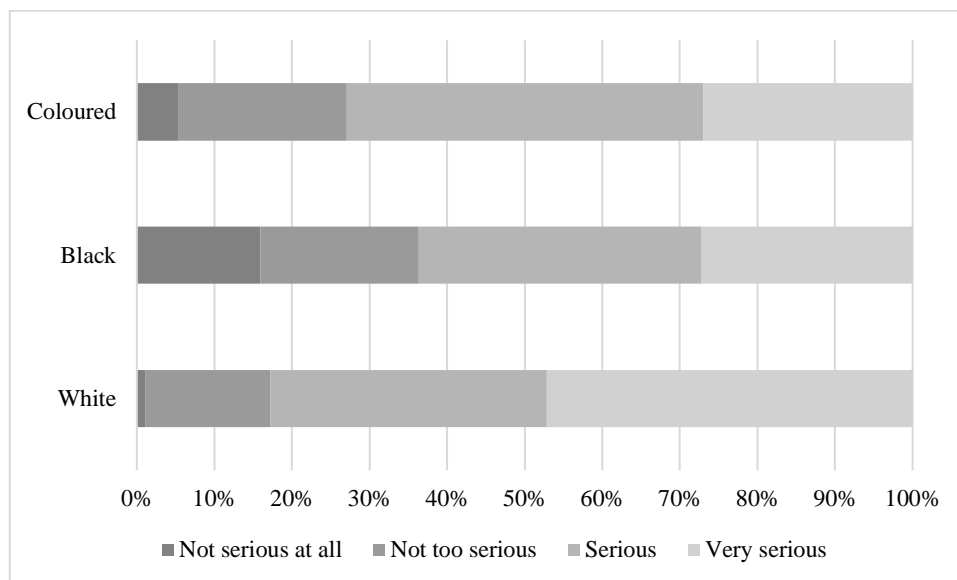


Figure 6.11. Population group: perceived seriousness of endangered species as an environmental problem

Testing the sample for differences among population groups, regarding the seriousness of climate change as an environmental problem, revealed that white individuals view climate change as a more serious environmental problem than African individuals ($F(190) = 4.880$, $df = 2$, $p < 0.05$) (Table 6.4). More than 60%

($n = 54$, 61.36%) of the white sample indicated that water scarcity is a “very serious” problem, compared to the African population who stated it the least ($n = 17$, 35.42%) (Figure 6.12).

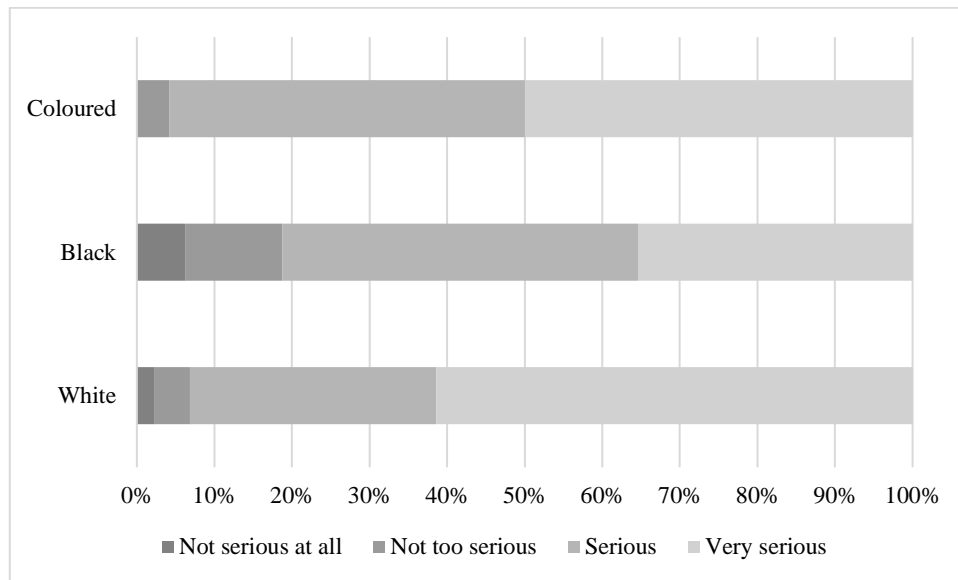


Figure 6.12. Population group: perceived seriousness of climate change as an environmental problem

6.2.1.3. Age

Age as a variable affected the use of four sources that the population can use to access environmental information: online sources, personal sources, national campaigns and radio (Table 6.5).

Table 6.5. Age: use of various sources (n) to access environmental information

Age	Online sources ($n = 181$)	Personal sources ($n = 181$)	National campaigns ($n = 181$)	Radio ($n = 181$)
60+	1.80 ^a	2.57 ^a	1.55 ^a	2.20 ^a
50–59	2.16 ^{ab}	2.59 ^a	1.87 ^{ab}	2.03 ^a
40–49	2.61 ^{bc}	2.22 ^a	1.58 ^a	2.42 ^{ab}
30–39	2.97 ^{cd}	2.63 ^a	2.27 ^b	2.53 ^{ab}
18–29	3.26 ^d	3.33 ^b	1.81 ^{ab}	2.96 ^b

Testing the difference between different age groups and the use of online sources for environmental information revealed that the use of online sources declined as an individual gets older ($F(181) = 9.445$, $df = 4$, $p < 0.05$) (Table 6.5). Ages 18 – 29 ($M = 3.26$, $SD = 0.984$) made the most use of online sources to access information about the environment. More than 50% ($n = 16$) of the age group 18–29 years old also stated that they use online sources “very regularly”, and ages 30–39, 44.83% ($n = 13$) stated that they use online sources ‘very regularly’ (Figure 6.13). On the other end of the age spectrum, over 30% of both age groups 50–59 ($n =$

11, 31.43%) and 60 + ($n = 18$, 38.30%) stated that they ‘never’ use online sources for information about the environment.

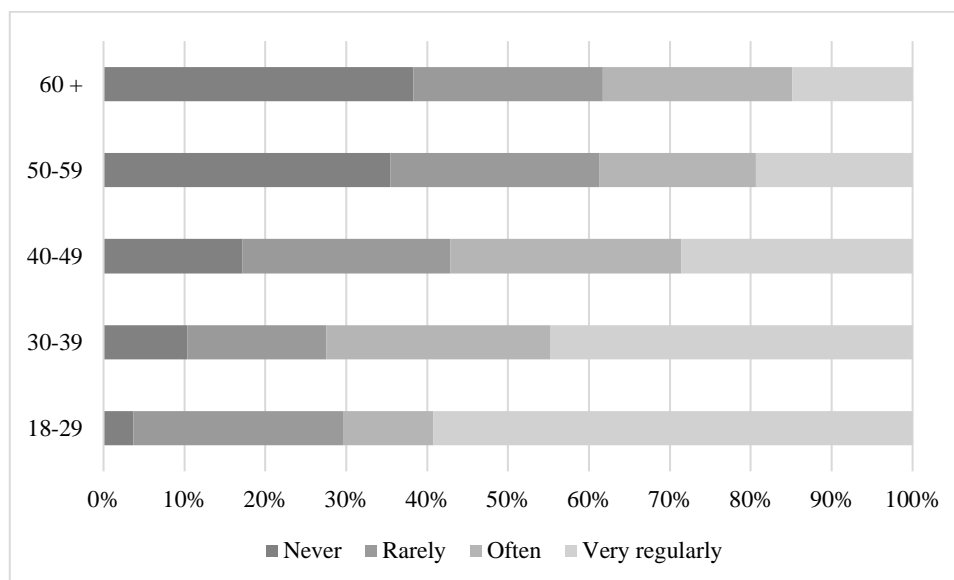


Figure 6.13. Age: online source use to access environmental information

Testing the sample for differences among age groups, regarding the use of personal sources to access environmental information, showed that younger individuals ($M = 3.33$, $SD = 0.877$) were more likely to use personal sources to get information about the environment ($F(181) = 4.616$, $df = 4$, $p < 0.05$) (Table 6.5). There is an also difference between age groups and the use of national campaigns as a source of environmental information. The age groups 30–39 ($M = 2.27$, $SD = 0.907$), 50–59 ($M = 1.87$, $SD = 1.008$) and 18–29 ($M = 1.81$, $SD = 0.879$) use the national campaigns more often than the age groups 40–49 ($M = 1.58$, $SD = 0.770$) and 60+ ($M = 1.55$, $SD = 0.971$) ($F(181) = 4.653$, $df = 4$, $p < 0.05$) (Table 6.5).

The use of radio to get information about the environment differs between age groups ($F(181) = 3.927$, $df = 4$, $p < 0.05$) (Table 6.4). It decreases as age increases, with the exception of age groups 50–59 ($M = 2.03$, $SD = 1.257$) and 60+ ($M = 2.20$, $SD = 1.299$) (Figure 6.12). More than 50% ($n = 14$, 51.58%) of the youngest age group, ages 18–29 ($M = 2.96$, $SD = 1.224$), stated that they use the radio “very regularly” for information about the environment (Figure 6.14).

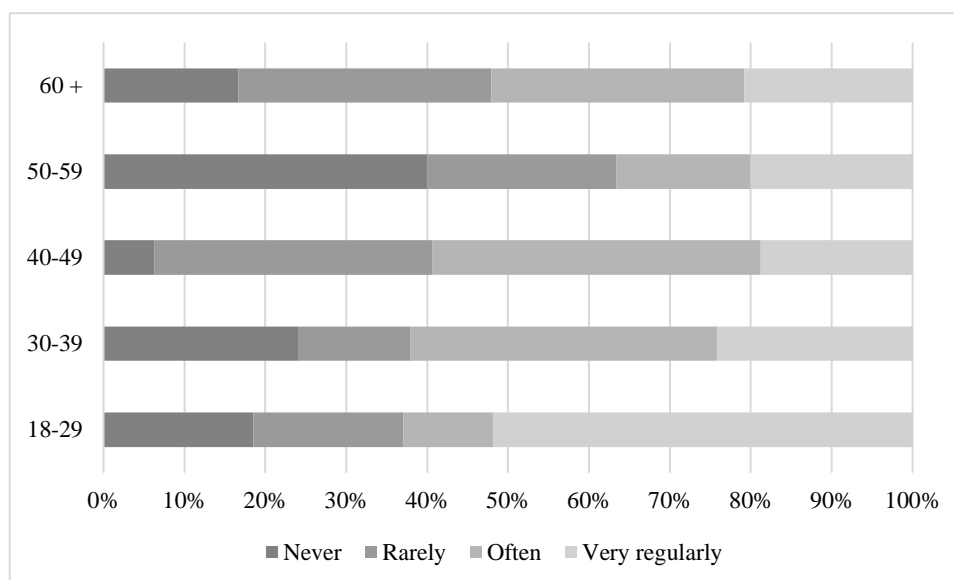


Figure 6.14. Age: radio use to access environmental information

Age did not correlate with a respondent's measured knowledge of the environment. It also did not affect how serious the respondents perceive environmental issues.

6.2.1.4. Religion

Religion did not correlate to any of the dependent variables.

6.2.1.5. Socio-economic status

The household income of a respondent was divided into five income groups: no income, R1–R4 000, R4 001–R16 500, R16 501–R57 000 and R57 001+. The income level of an individual correlated with the use of two environmental information sources: radio and online sources (Table 6.6).

Table 6.6. Household income: use of various sources (*m*) to access environmental information

Income	Radio (<i>n</i> = 144)	Online sources (<i>n</i> = 144)
No income	3.44 ^c	2.33 ^{ab}
R1 – R4 000	2.13 ^{ab}	1.75 ^a
R4 001 – R16 500	2.85 ^{bc}	2.62 ^b
R16 501 – R57 000	2.42 ^{ab}	2.79 ^b
R57 001 +	1.76 ^a	2.88 ^b

Analysing differences between an individual's income level using radio as a source of environmental information, indicated that there is a difference between income levels ($F(144) = 4.377$, $df = 4$, $p < 0.05$) (Table

6.6). The use of the radio for environmental information is significantly higher for the part of the population that has no income ($M = 3.44$, $SD = 1.014$), compared to individuals with an income.

Analysis of the effect of income on the use of online sources to access environmental information, indicated that the three highest income levels are more likely, compared with the lower income levels, to use online sources to get information about the environment ($F(181) = 5.405$, $df = 4$, $p < 0.05$) (Table 6.6). The higher the income group, the more they make use of online source to receive information about environmental issues. Of the highest income group (R 57 000+), more than 40% ($n = 7$, 41.18%) use online source “very regularly” to get information about the environment (Figure 6.15). Similarly, 37.25% ($n = 19$) of the second highest income group (R16 501–R 57 000) use online sources “very regularly”. On the opposite end, 50% ($n = 18$) of the lowest income group stated that they ‘never’ use online sources for environmental information.

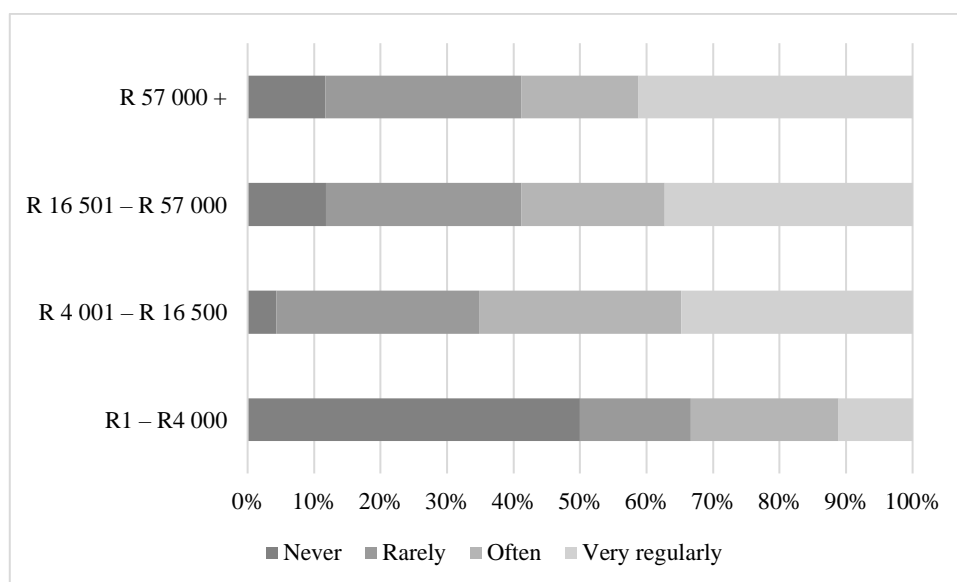


Figure 6.15. Household income: online source use to access environmental information

An individual’s household income correlated with the amount of questions a person answered correctly. In other words, their environmental knowledge (Table 6.7). The group with no income ($M = 7.667$, $SD = 2.6926$) and the lowest income group (R1–R4 000) ($M = 7.7250$, $SD = 2.0999$) answered fewer questions correctly, than those with a higher household income ($F(144) = 12.001$, $df = 4$, $p < 0.05$) (Table 6.5).

Table 6.7. Household income: knowledge (*m*) about the environment

Income	Knowledge questions (<i>n</i> = 144)
No income	7.67 ^a
R1–R4 000	7.73 ^a
R4 001–R16 500	8.92 ^b
R16 501–R57 000	10.078 ^b
R57 001+	9.88 ^b

An individual's household income potentially influenced how seriously respondents perceived five environmental problems (Table 6.7). With all problems, the higher the household income, the more seriously a problem was perceived.

Table 6.8. Household income: seriousness (*m*) of environmental problems

Income	Water scarcity (<i>n</i> = 144)	Overfishing (<i>n</i> = 144)	Ocean pollution (<i>n</i> = 144)
No income	2.56 ^a	2.44 ^{ab}	3.00 ^{abc}
R1 – R4 000	3.12 ^b	2.25 ^a	2.42 ^{ab}
R4 001 – R16 500	3.42 ^{bc}	3.08 ^{bc}	2.23 ^a
R16 501 – R57 000	3.81 ^c	3.10 ^{bc}	3.10 ^{bc}
R57 001 +	3.88 ^c	3.42 ^c	3.53 ^c
Income	Wildlife poaching (<i>n</i> = 144)	Species endangerment (<i>n</i> = 144)	
No income	2.33 ^b	2.00 ^a	
R1 – R4 000	2.79 ^a	2.43 ^{ab}	
R4 001 – R16 500	2.62 ^{ab}	2.81 ^{abc}	
R16 501 – R57 000	3.23 ^{bc}	2.96 ^{abc}	
R57 001 +	3.59 ^c	3.41 ^c	

The more a respondent earns, the more serious the person viewed water scarcity ($F(144) = 8.670$, $df = 4$, $p < 0.05$) (Table 6.8). The two highest income groups (R16 501–R57 000 and R57 001+) view the water scarcity as more serious than the two lowest income groups (R1–R4 000 and R4 001–R16 500), who viewed it as more serious than the group that has no income.

Analysing the sample for differences among income levels, regarding how seriously overfishing is viewed an environmental problem, revealed that the highest income group (R57 001+) viewed it as a more serious problem than the two lowest income groups ($F(144) = 4.986$, $df = 140$, $p < 0.05$) (Table 6.8). There is also a difference between income levels and how seriously ocean pollution is perceived as an environmental problem ($F(144) = 5.097$, $df = 4$, $p < 0.05$). The two highest income groups of the sample (R16 501–R57 000 and R57 001) consider it as a more serious problem than the second lowest income group (R4 001–R 16 500) and the group with no income. These two groups also viewed this problem as more serious in compared with the lowest income group (R1–R4 000).

There is a difference between income levels and how seriously wildlife poaching is seen an environmental problem. The two highest income groups (R16 501–R57 000 and R57 001+) perceived it as a more serious problem than the three lower income groups ($F(144) = 5.472$, $df = 4$, $p < 0.05$) (Table 6.8). There were significant differences between the income groups and how seriously the endangerment of species is perceived as an environmental problem ($F(144) = 3.182$, $df = 4$, $p < 0.05$) (Table 6.8). The highest income group (R57 000+) viewed it as a more serious problem than the lowest income group and the group without an income.

When analysing the difference between income levels and how seriously climate change is viewed as an environmental problem, the results showed that the lowest income group (R1–R4 000) views it as significantly less serious as the two highest income groups ($F(135) = 3.608$, $df = 3$, $p < 0.05$) (Table 6.9).

Table 6.9. Household income: seriousness (m) of climate change as an environmental problem

Income	Climate change ($n = 135$)
R1 – R4 000	2.88 ^a
R4 001 – R16 500	3.54 ^b
R16 501 – R57 000	3.42 ^b
R57 001 +	3.29 ^{ab}

6.2.1.6. Education

The population's level of education was divided into two groups: primary and high school, and FET and tertiary. The education level of the population correlated with the use of three environmental information sources: television, online sources and newspapers (Table 6.9). With all three examples, more educated respondents used the information source more than less educated respondents.

Table 6.10. Education: use of various sources (m) to access environmental information

Education level	Television ($n = 131$)	Online sources ($n = 131$)	Newspapers ($n = 131$)
Primary to high school	2.40	1.94	2.28
FET and tertiary	2.79	2.73	2.74

The use of television as an environmental information source increased as an individual gets more educated ($M = 2.79$, $SD = 1.238$) ($t(181) = 2.166$, $p < 0.05$) (Table 6.10). There was a difference between education levels in their use of online sources to get information about the environment ($t(129) = -4.005$, $p < 0.05$) (Table 6.10). Higher educated individuals ($M = 2.73$ $SD = 1.076$) are more likely to use online sources than lower educated levels ($M = 1.94$, $SD = 1.268$). More than 30% ($n = 24$, 39.34%) of the group with the highest education level (FET and tertiary) stated that they use online sources 'very regularly' (Figure 6.16).

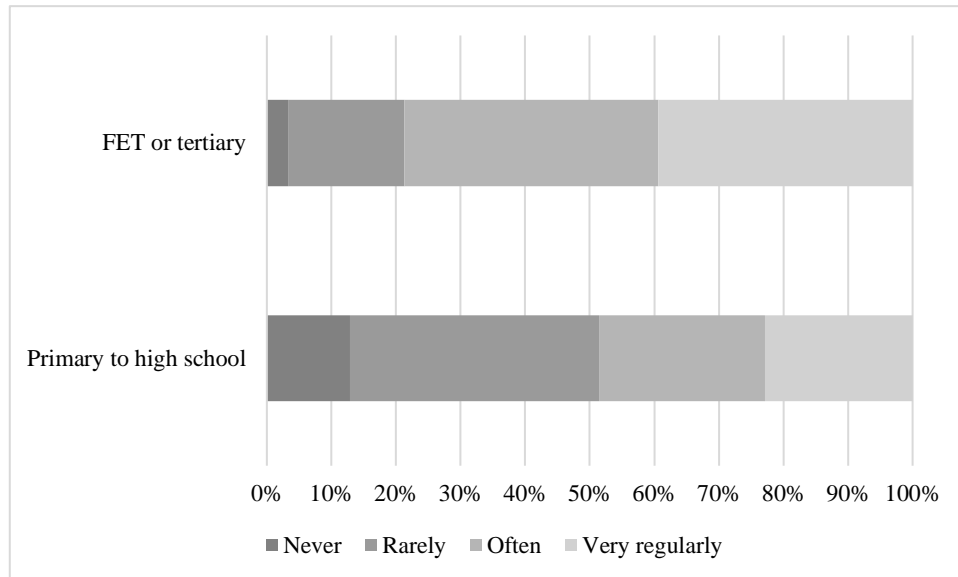


Figure 6.16. Education: online sources use to access environmental information

Analysing the sample for differences among education levels, regarding the use of newspapers as a source of environmental information, revealed that more educated respondents ($M = 2.74$, $SD = 0.950$) are more likely to use newspapers to get information about the environment compared to less educated respondents ($M = 2.28$, $SD = 1.1224$) ($t(140) = -2.877$, $p < 0.05$) (Table 6.10). Supporting this, the highest education group (FET or tertiary education) stated the most that they used newspapers ‘very regularly’ ($n = 23$, 31.08%) (Figure 6.17).

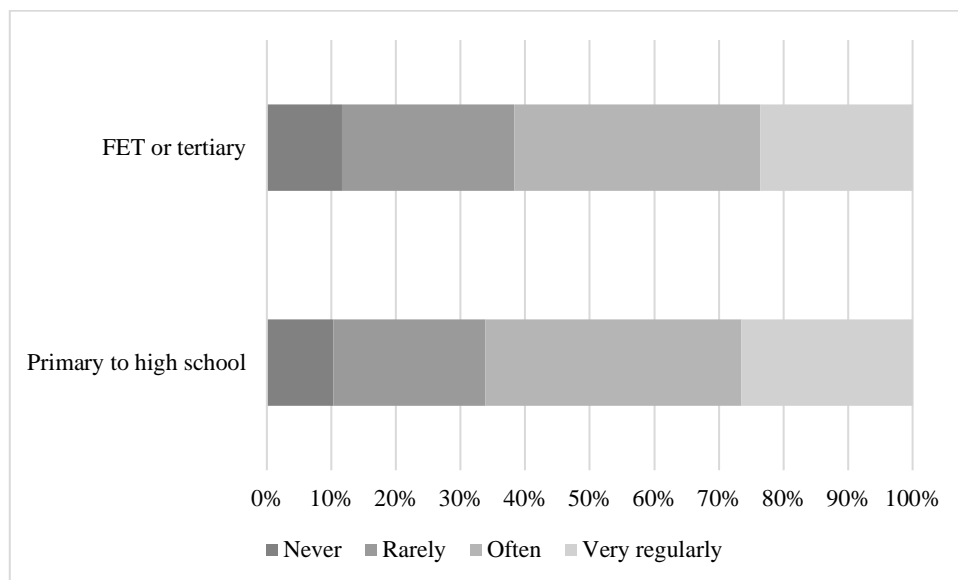


Figure 6.17. Education: newspaper use to access environmental information

The level of education of a respondent also had a potential effect on their knowledge of the environment, based on the 11 questions asked in the survey. The higher educated part of the population ($M = 10.0103$, $SD = 1.3655$)

answered more questions correctly than the lower educated ($M = 8.0698$, $SD = 2.0453$) part of the population ($t(183) = -7.624$, $p < 0.05$) (Table 6.11).

Table 6.11. Education: knowledge (m) about the environment

Education level	Knowledge questions ($n = 183$)
Primary to high school	8.07
FET and tertiary	10.01

The education level of a respondent correlated with ten of the 11 environmental problems. For all ten environmental problems, the higher educated population viewed it as more serious than the lower educated population (Table 6.12).

Table 6.12. Education level: seriousness (m) of environmental problems

Education level	Water scarcity ($n = 183$)	Habitat destruction ($n = 183$)	Overfishing ($n = 183$)	Invasive species ($n = 183$)	Fresh water pollution
Primary to high school	3.35	2.80	2.60	1.94	3.13
FET and tertiary	3.71	3.21	3.01	2.59	3.48
Education level	Ocean pollution ($n = 183$)	Terrestrial pollution ($n = 183$)	Wildlife poaching ($n = 183$)	Endangered species ($n = 183$)	Climate change ($n = 183$)
Primary to high school	2.48	2.97	2.44	2.37	3.14
FET and tertiary	3.09	3.31	3.22	3.09	3.45

Testing the sample for differences among various education levels, regarding their perception of water scarcity as an environmental problem, revealed that those with a more advanced education ($M = 3.71$, $SD = 0.692$) viewed the problem as more serious than those with a lower education level ($M = 3.35$, $SD = 0.692$) ($t(181) = -3.147$, $p < 0.05$) (Table 6.12). There was also a difference between education levels and how serious habitat destruction is perceived as an environmental problem ($t(181) = -2.584$, $p < 0.05$). Individuals with a more advanced education level ($M = 3.21$, $SD = 0.816$) perceived the destruction of natural habitats as a more serious environmental problem than those with a lower education level ($M = 2.80$, $SD = 1.273$) (Table 6.12).

The results in Table 6.12 also indicates that highly educated individuals ($M = 3.01$, $SD = 1.195$), viewed overfishing as significantly more serious compared to less educated individuals ($M = 2.60$, $SD = 1.268$) ($t(181) = -2.228$, $p < 0.05$) (Table 6.12). Similarly, when analysing the difference between education levels and how serious invasive species are viewed as an environmental problem, the results showed that there was a

significant difference between education levels ($t(181) = -3.555, p < 0.05$) (Table 6.12). More educated individuals ($M = 2.59, SD = 1.028$) viewed invasive species as a more serious environmental problem, compared to less educated individuals ($M = 1.94, SD = 1.417$).

Analysing the sample for differences among education levels, regarding their view on how serious fresh water pollution is as an environmental problem, again, revealed that more educated respondents ($M = 3.48, SD = 0.738$) perceived it as a more serious problem than less educated respondents ($M = 3.13, SD = 0.968$) ($t(181) = -2.821, p < 0.05$) (Table 6.12). There was a difference between education levels and how seriously ocean pollution was perceived as an environmental issue ($t(181) = -3.323, p < 0.05$) (Table 6.12). More educated respondents perceived it as more serious less educated respondents ($M = 3.09, SD = 1.109$). Likewise, higher educated respondents ($M = 3.31, SD = 0.834$) see terrestrial pollution as a more serious environmental problem than less educated respondents ($M = 2.97, SD = 1.287$) ($t(181) = -2.170, p < 0.05$) (Table 6.21).

There is a significant difference between various education levels and how serious wildlife poaching is viewed as an environmental issue ($t(181) = -4.253, p < 0.05$) (Table 6.12). Higher educated respondents ($M = 3.22, SD = 0.960$) perceived it as a more serious environmental problem than less educated individuals ($M = 2.44, SD = 1.476$). Looking at the difference between different education levels and how seriously endangered species is perceived as an environmental problem, revealed that there is a significant difference between higher educated and lower educated individuals ($t(181) = -3.997, p < 0.05$) (Table 6.12). More educated respondents ($M = 3.09, SD = 0.925$) viewed endangered species as a more serious environmental problem when compared to those with a lower education ($M = 2.37, SD = 1.480$). Testing the difference between different education levels and how seriously climate change is viewed as an environmental problem revealed that more educated individuals ($M = 3.45, SD = 0.842$) viewed the environmental problem as more serious than less educated individuals ($M = 3.14, SD = 0.996$) ($t(181) = -2.311, p < 0.05$) (Table 6.12).

6.3. Discussion

“Take people from different backgrounds and place them in the same situation; they are likely to differ in what they make of it.” (Ingold, 2000:157)

The results in this section suggested that selected socio-demographic variables correlated with the environmental information sources an individual uses, the environmental knowledge of a respondent and the perceived seriousness of environmental problems. Observed differences could be due to the heterogeneity of the examined country, such as differences in cultures and economic statuses (Shen & Saijo, 2008).

The population group, age, income status and level of education of an individual potentially influence the source an individual might use to access information about the environment. The results suggested that Caucasian, higher educated individuals with a higher income have more knowledge about the environment, when compared with other parts of the population.

The results identify gender, population group, household income and education as socio-demographic variables that might play a role in determining how seriously an environmental problem is seen by an individual. Neither religion nor age affected how seriously an individual perceived environmental problems. The results represented here indicate that white females from higher educated backgrounds and higher income levels are the most concerned about environmental problems. This is similar to previous findings in the US where younger, white females with higher levels of education are more concerned about the environment when compared to their counterparts (Barkan, 2004).

6.3.1. Gender

The gender of a respondent did not influence the information sources an individual used or the knowledge an individual had about the environment. It did, however, correlate with how seriously environmental problems were perceived by the population.

The gender of an individual correlated with the perception of three environmental challenges: ocean pollution, endangered species and climate change. In all three these cases, women perceived these problems as significantly more serious than men. It has been said that at community and household levels, men and women may play different roles in caring for and protecting the environment (Vicente-Molina, Fernández-Sainz & Izagirre-Olaizola, 2018)

A possible explanation could be that men are able to accept a higher degree of environmental damages, probably due to their ability to withstand and take risks more than females (Eisler *et al.*, 2003). Women might also perceive environmental risks more severe in comparison to men (Scalia, 2017). Women might even feel more vulnerable to environmental risks than males (Langlois, 2012).

Females believe, more so than men, that the conservation of the natural environment is an important part of human existence (Eisler *et al.*, 2003). Cultural norms, gender socialisation, and the role of women as mothers and caregivers, makes them more compassionate, protective and nurturing. This may result in a higher concern for the natural environment and a protective attitude towards nature (Casey & Scott, 2006; Gelissen, 2007; Hunter *et al.*, 2004; Langlois, 2012; Levy *et al.*, 2018; Torgler *et al.*, 2008; Vicente-Molina *et al.*, 2018).

6.3.2. Population group

The population group of a respondent potentially influenced the use of six environmental information sources: television, online sources, books, national campaigns, formal sources and the radio. Online sources, books and formal sources were used more by white than African or coloured respondents. The higher use of the Internet by the white sample is to be expected. Fifty percent of South Africans who use the Internet are white, 33% are African, 7% coloured, and the remainder Indian (Effective Measures, 2017). This also explains why African individuals use the Internet second most.

The reason why more white people in this sample read more books and access more formal sources for environmental information may be because the white individuals in the population may have more access to

these sources, due to historical reasons. It was found that white males and females are the part of the South African population that is most likely to read for leisure (South African Book Development Council, 2016).

African respondents watch television for information about the environment, more than the other two population groups in the population. This is not a surprising finding. Of the total number of television viewers in South Africa (37.1 million), 79% are African respondents (BRC, 2017b). v.

The population group of an individual in the population correlated with eight out of eleven environmental problems: water scarcity, habitat destruction, overfishing, fresh water pollution, ocean pollution, wildlife poaching, endangered species and climate change. This may indicate that the population group of an individual plays an important role in how individual perceptions about the environment is formed. It has been suggested that perceived environmental concern differences between African and white individuals are largely due to generations of societal separation between the African and white society (Newell & Green, 1997). This is a factor that is of special relevance in South Africa (Anderson *et al.*, 2007).

With all eight environmental problem examples, white respondents scored a higher mean, indicating that they view these problems as more serious than the other population groups. These results are comparable to those of other studies (Blake, 2001; Mohai & Bryant, 1998; Parker & McDonough, 1999).

A social-psychological explanation for the population group difference in perceptions could be the difference between African and white South Africans' socio-economic statuses. A possible explanation for these socio-economic differences in environmental perceptions could be the ongoing influence of apartheid on attitudes and behaviours of the non-white population in South Africa (Anderson *et al.*, 2007; Anderson *et al.*, 2013). Africans are a minority group in society, living in poorer conditions, and they might feel helpless with regard to environmental issues, policies and regulations (McMillan *et al.*, 1997; Mohai & Bryant, 1998). This also provides an explanation for the *Hierarchy of Needs* theory. It rests on the assumption that concern for the environmental can be seen as a luxury good, and it can only be enjoyed only after more basic material needs are met, such as shelter, adequate food, and economic security (Shen & Saijo, 2008; Van Liere & Dunlap, 1980). Poorer living conditions could mean that environmental problems are not an issue that they want solved first, but rather other social issues, such as poverty and lack of service delivery (Barkan, 2004; Mohai & Bryant, 1998). However, it should be noted, that, strictly speaking, the hierarchy of needs explanation does not account for a unique "population group" correlation with environmental perceptions, but rather for a possible "socio-economic" effect on environmental perceptions (Mohai & Bryant, 1998). This also relates to Inglehart's (1977) *Postmaterialism* theory. It is a value orientation that emphasizes quality of life over physical and economic security (Inglehart, 1977). Meaning, that affluent members of society who are already secure can spend time and money on the environment. It must also be noted that there is a divergence between population groups and areas where they live in South Africa (Zeelie, 2003) and due to the close affinity of white South Africans to the western world, white South Africans' attitudes would be similar to those of the developed world (Beckett, 2013).

6.3.3. Age

The age category of an individual correlated with the use of four of eleven sources of environmental information: online sources, personal sources, national campaigns and radio.

The high Internet usage by 18–29-year olds are similar to results obtained in a 2017 survey, that showed that 37.84% of all internet users in South Africa come from this age category. This is the highest use of all the age categories (Effective Measures, 2017). The high use of radio to access environmental information is not surprising as, according to *The Broadcast Research Council of South Africa* (BRC), the age category 15–34 listens more to the radio than older age categories (BRC, 2017a). A possible reason for the high usage of personal sources could be that the younger generation is most likely to be more social than older generations and their pro-environmental behaviours may be influenced by interpersonal communication (Nelms *et al.*, 2017). The more often an individual talks with others about environment and environmental issues, the more knowledgeable they may become about environmental issues and events (Tindall *et al.*, 2017).

The age of a respondent did not affect his or her environmental knowledge. The relationship between age and perceptions about the environment remains undetermined, as it has not yet been possible to determine consistent significant correlations between age and environmental perceptions and behaviours (Casey & Scott, 2006; Dietz *et al.*, 1998; Hines, Hungerford & Tomera, 1987; Olli *et al.*, 2001; Van Liere & Dunlap, 1980).

6.3.4. Religion

With this population, the presence or lack of religion did not have any influence on what information sources individuals used to access information about the environment, or how knowledgeable they were about the environment. It also did not influence how seriously individuals perceive environmental issues. Similar results have been found in the past. When there were other socio-demographic variables at play, religion was not a predictor of support for environmental concern (Casey & Scott, 2006; Kanagy & Nelsen, 1995). The small sample of people who identified as non-religious could also have influenced the results.

6.3.5. Household income

The household income of a household played a role in the use of two different environmental information sources: radio and online sources. Individuals with no income used radio more than the other income groups. The income group with the highest income (R57 000 +) made use of online sources more than the other income groups.

Radio might be the only affordable information resource for many low-income households in South Africa, resulting in the high use by those with low incomes and no incomes. In South Africa, more than 50% of households with no income and low income households own radios (Stats SA, 2015). The use of online sources to access environmental information increases as income increased from R4 000 and more. Of the adult South Africans who earn more than R30 000 a month, 82.4% make use of the Internet (World Wide Worx, 2017).

A similar explanation can be used for why respondents with higher incomes have more knowledge about the environment. A higher income could mean easier access to information sources. A similar profile of American and Chinese adults has been created, where an environmentally knowledgeable person was defined as highly educated and having an income above the median household income (Arcury, 1990; Cheung *et al.*, 2015; O'Brien, 2007).

The economic status of an individual's household also correlated with how serious individuals perceive five environmental problems: water scarcity, overfishing, ocean pollution, wildlife poaching and endangered species. A positive relationship was observed between income and the perceived seriousness of the environmental problems and household income. The highest income group perceived the problems as more serious than the other income groups. Some explanations exist for this positive relationship: middle and upper class households are typically better educated, and experience better home, work and recreational environments, and therefore can be more concerned about environmental degradation (Casey & Scott, 2006).

High income residents in China had more concern for environmental issues compared to other social issues (Bi *et al.*, 2010). In Nigeria, individuals from a higher social class also exhibited more pro-environmental behaviours (Ifegbesan & Rampedi, 2018).

This relationship between income class and concern for the environment is frequently explained with reference to Maslow's *Hierarchy of Needs* theory (Chanda, 1999; Maslow, 1970). Standard economic reasoning suggests that conservation of the natural environment is a normal, public good and the demand will increase as income increases (Franzen, 2003). A higher household income allows people to spend proportionally less on material needs and supplies (Olli *et al.*, 2001), but also allows an individual to invest in making environmentally efficient improvements to their houses. People who lived in Indian slums and villages were less concerned about the environment and placed a low importance on environmental problems, because they have limited alternatives for economic activities (Rajapaksa *et al.*, 2018).

The generalisation here is that individuals from lower class areas are more exposed to (e.g.) pollution and overcrowdedness such that residents have accepted or grown used to low-quality environmental conditions. Higher income classes, living in neat and enjoyable conditions, are more likely to be sensitive to the evidence of environmental deterioration (Chanda, 1999). Poorer social classes are likely to be more concerned about "bread-and-butter" issues and consider concern about the environment a luxury they cannot afford (Chanda, 1999:37). Individuals from lower incomes groups may also place the environmental responsibility on other entities, e.g. the government (De Lavega, 2004). An individual with a higher income may have a better understanding of environmental problems and might be more likely to take part in environmentally friendly activities (Hao, 2014).

Another explanation for this association could be that better educated individuals could possibly have higher incomes, which, presumably, allow them to be more concerned about environmental problems (Gelissen, 2007), as shown with the correlation between education and income. Affluent members of societies may be

less pre-occupied with financial struggle and be free to pursue environmental protection and conservation activities (Franzen & Meyer, 2010).

Education

A respondent's education level correlated with the use of three sources of environmental information: television, online sources and newspapers. In all three cases, better educated respondents (FET or tertiary education) used the environmental information source more than those with less education (primary to high school). In many cases a higher education resulted in a higher income, explaining why television and online sources get used more to access environmental information by more educated individuals.

More than 80% of middle to high income households owns a television. Similar results were observed in Botswana, where those with higher education levels used the television to access information about the environment more than those with a lower education level (Thakadu & Tau, 2012).

Education correlated with people's Internet access. In South Africa computer ownership also increase with income (Stats SA, 2015), indicating that higher income households may have better access to the Internet. Fifty-five percent of those with a grade 12 education in South Africa have access to the Internet, and this increases to 71.6% for those with a post-matric qualification (World Wide Worx, 2017). Higher educated individuals tend to be more regular readers of newspapers (Besley & Shanahan, 2004; Nisbet *et al.*, 2002).

The positive relationship between education level and knowledge is to be expected. Higher education levels resulted in more general knowledge about the environment. Individuals with better educational backgrounds may have more opportunities to acquire environmental information and information about environmental issues (Arcury, 1990; Chanda, 1999; Cheung *et al.*, 2015)

The education level of an individual influenced how seriously a respondent perceived the environmental problems. Better educated respondents viewed all the environmental problems as more serious than their less well-educated counterparts. Similar results have been observed in previous studies. In Texas, USA and Britain education is positively related to environmental concern (Clements, 2012; Klineberg *et al.*, 1998). In Ghana, literate individuals were much more likely to express high environmental concern than illiterate individuals (White & Hunter, 2009), and in Nigeria higher educated individuals showed more pro-environmental behaviour.

The positive relationship between education and environmental concern can be explained by highly educated people being more exposed to and able to understand environmental information (Gifford & Nilsson, 2014; Olli *et al.*, 2001). Education also generally increased an individual's knowledge the environmental problems and should, therefore, also increase environmental concern (Franzen & Vogl, 2013). The lack of environmental education may also lead to a lower awareness of environmental problems and lower expectancies of what is the extent of environmental problems (Stefanexcu & Baltatexcu, 2013). This effect of education can be

explained in terms of the *enlightenment hypothesis*: higher education leads to a greater commitment to the common good, which may also lead to a greater commitment to conserving the environment (Gelissen, 2007).

6.4. Conclusions

The results from this chapter strengthen and extend previous findings that socio-demographic variables can shape perceptions of the environment and environmental problems. These findings can be practically employed in policies to create and maintain management procedures better to conserve the environment (Torgler *et al.*, 2008).

The results presented in this chapter provided partial support for hypotheses 3 to 8. The results suggested that an individual who is more concerned about the environment is likely to be a white, well-educated female, and comes from a higher social class.

H3 was rejected, as religion did not influence the environmental perceptions of the population. Females perceived environmental problems as more serious than their male counterparts. Therefore, H4 is confirmed. H5 is also confirmed, as white respondents showed more concern for the environment than other population groups. Age did not influence how respondents perceived environmental problems, resulting in H6 being rejected. H7 and H8 are both confirmed, as a higher education level and a higher average income influenced the environmental perceptions of the environment.

The three socio-demographic variables of population group, education and income are especially consistent in explaining information source use, environmental knowledge and the environmental problems and concerns measured in the present study.

Other than income level and population group, education has the strongest effect on environmental concern. As population group and income cannot be controlled, the best way to keep individuals environmentally concerned seems to be through increased access to education (Franzen & Vogl, 2013).

Better education and communication programmes of the precise causes and consequences of environmental issues may help the public become more sensitive to a wide range of environmental problems and challenges (Brody, Zahran, Vedlitz & Grover, 2008). Perhaps by incorporating more classes about the environment and environmental dangers into schools' curricula, awareness about the environment could increase (Franzen & Vogl, 2013).

Even though income class cannot be changed, class-based strategies to raise public awareness about environmental issues should be adopted (Chanda, 1999). Communication policies and plans to raise environmental awareness outside the formal education system need to be socio-economically sensitive to produce a greater effect; for example, environmental quality improvement strategies may be linked to poverty improving initiatives, among the poorer residents of an area (Chanda, 1999).

The research indicated that females show higher levels of environmental concern. This presents a strong case for better representation of women on committees, boards and in other positions of power requiring contribution and collaboration for decision-making about environmental issues (Torgler *et al.*, 2008).

Well-educated, Caucasian females with higher incomes are also considered to be the most knowledgeable about the environmental problems. This confirms H2, that well educated individuals will be more knowledgeable about the environment.

Another finding to emerge from the survey data is that respondents use some sources to access environmental information noticeably more than other sources. White females with high incomes mostly use online sources, books and newspapers to access information about the environment. This could suggest that media could act as powerful channels for communicating scientific information about the environment to the public (Brewer & Ley, 2013), especially since these sources reach large audiences.

Focus should be placed on communicating to those who are less knowledgeable about the environment. The future of environmental communication should therefore make use of sources that are used the most by individuals, but also the sources which the media and environmental organisations have access to. These sources should be used to promote environmental awareness and improve environmental knowledge of the public. These results could guide environmental communicators and educators and policymakers in the process of communicating valuable environmental information to the general public and to focus on those that are less informed: those citizens without university degrees and from low household incomes (Ito & Kawazoe, 2017).

Chapter 7: The strongest factors influencing the public's perceptions of the environment

7.1. Introduction

To answer research question 6 about the strongest variables influencing perceptions of the environment and environmental challenges (how seriously individuals view environmental problems), linear regressions were tested.

7.2. Results

7.2.1. Correlation analysis

A set of explanatory variables were tested for correlation with environmental concern: environmental knowledge index, information source index, gender, population group, education, income, age and religion. The correlation analysis of an environmental problem perception index (dependant variable) with all the explanatory variables revealed eight significant ($p < 0.05$) correlations (Table 7.1). These results were used to determine what variables to use in the linear regression analysis to determine the strongest variables influencing environmental perceptions.

Table 7.1. Results of the correlation analysis for significant predictor variables determining perceptions about environmental problems ($p < 0.05$)

Variable		Pearson's correlation coefficient
Environmental knowledge index		0.38
Information sources index		0.16
Socio-demographic variables	Gender: male	-0.17
	Gender: female	-0.17
	Population group: white	0.41
	Population group: African	-0.37
	Education	0.31
	Income	0.37

7.2.2. Regression analysis

Using perceptions about the environment and environmental challenges as the dependant variables, linear regression was analysed with different predictor variables: environmental knowledge, information sources, gender, population group, education and income (Table 7.2). In model 1, with only socio-demographic predictor variables, not being from the African population (being coloured or white) was the only variable influencing how seriously an individual perceived environmental problems. The predictor variables change when the information source index is added. In model 2, not being an African individual, and the amount of information sources used influences how seriously the population perceived environmental problems. However, model 3 has the best fit ($F = 10.668$, $df = 7$, $p < 0.05$) (Table 7.2). A Durbin-Watson score (DW) of

2.181 is revealed, indicating no negative autocorrelation. Model 3 showed that individuals that are female, not African in population group and have a better knowledge of the environment view environmental problems as more serious. The adjusted R square statistics are 0.356 for environmental problem perception, indicating that the three significant predictor factors (population group, gender and knowledge) explained 35.6% of the model. **Table 7.2. Results of linear regression for factors predicting environmental perceptions**

	Model 1		Model 2		Model 3	
Variables	β	t	β	t	β	t
<i>Dependent variable: perceptions about the environment and environmental challenges</i>						
Gender: female	0.13	1.84	0.14	1.91	0.15*	2.08
Population group: white	0.14	1.11	0.16	1.27	0.12	1.02
Population group: African	-0.38*	-3.78	-0.42*	-4.26	-0.36*	-3.55
Income	-0.02	-0.18	-0.05	-0.48	-0.08	-0.72
Education	0.09	0.99	0.06	0.68	0.01	0.11
Information sources			0.18*	2.51	0.11	1.42
Environmental knowledge					0.24*	2.59

*significant for $p < 0.05$

Testing each environmental problem separately revealed similar models, except for climate change as an environmental problem. The predictor variables change when climate change is looked at as an individual environmental problem. In models 1 and 2, being a female with better levels of education, being either coloured or white influence how seriously climate change is perceived as an environmental problem (Table 7.3). The predictor variables change again in model 3 ($F = 3.456$, $df = 7$, $p < 0.05$ DW = 2.189). In model 3, being a female with better environmental knowledge indicates that climate change as an environmental problem is perceived as more serious. The adjusted R square statistics are 0.157 for perceptions about climate change as an environmental problem.

Table 7.3. Results of linear regression for factors predicting environmental perceptions about climate change

	Model 1		Model 2		Model 3	
Variables	β	t	β	t	β	t
<i>Dependent variable: perceptions about climate change</i>						
Gender: female	0.19*	2.25	0.19*	2.25	0.21*	2.53
Population group: white	-0.13	-0.87	-0.12	-0.85	-0.15	-1.07
Population group: African	-0.27*	-2.32	-0.27*	-2.33	-0.19	-1.58
Income	-0.06	-0.48	-0.06	-0.50	-0.08	-0.65

Education	0.24*	2.33	0.24*	2.28	0.19	1.71
Information sources			0.02	0.28	-0.03	-0.37
Environmental knowledge					0.23*	2.03

*significant for $p < 0.05$

7.3. Discussion

The results from the linear regressions indicated that perceived seriousness about environmental problems were mainly influenced by knowledge about the environment, being female and being either coloured or white. Education, income and the source of environmental information do not serve as significant predictors for the model with the best fit, model 3.

The model fit statistics are also broadly similar to those reported in other analyses of the sociological and attitudinal factors shaping public concern for the environment. In the UK, gender and education influenced the respondents' perceptions of environmental impacts (Clements, 2012). Similarly, in a model including gender, it also influenced the public's attitude toward environmental issues in the USA (Konisky, Milyo & Richardson Jr, 2008).

The predictor variables in the model with the best fit changed when trying to determine what correlates with the public's perception about climate change specifically. Population group no longer plays a role, and gender and environmental knowledge are the only predictors of climate change perceptions. Knowledge of climate change has been shown to support pro-environmental climate change behaviour (O'Connor *et al.*, 1999).

7.4. Conclusion

The linear regression created three models, of which the third model was the best fit. In the first two models, being female, Caucasian or coloured, and having a high level of education were the variables that correlated with the environmental perceptions of an individual. However, when environmental knowledge is added as a predictor variable, level of education does not influence an individual's perceptions about the environment. Therefore, environmental knowledge, gender and population group have the strongest influences on how the public perceive the environment and environmental challenges: female, Caucasian individuals with high levels of environmental knowledge will perceive environmental problems as more serious and threatening. In general, socio-demographic characteristics only explained a very small proportion of the variance of environmental perceptions.

The predictor variables changed when looking at climate change as an individual environmental issue and population group is not a predictor of climate change concern, excluding another socio-demographic variable. However, females and individuals with high levels of knowledge about the environment view climate change as a severe and threatening environmental problem.

The results can be used to focus on educating individuals on the severity of environmental problems, as more knowledge about the environment influences an individual's perception about environmental problems. It also

suggests that females and individuals with knowledge about environmental issues would be more aware and able to protect themselves from any impacts of environmental degradation.

Chapter 8: Stellenbosch publics and their differences in perceptions toward environmental challenges

8.1. Introduction

A cluster analysis offers an interesting approach by identifying different publics of the larger Stellenbosch public in more detail (Guenther & Weingart, 2018). The cluster analysis examine the scores respondents provide on the survey questionnaire Likert-scale items (Barr & Gilg, 2006).

8.2. Results

8.2.1. Cluster analyses

To determine if there are differences between publics and their environmental perceptions (RQ 7), a hierarchical cluster analysis was done. To determine the ideal number of clusters, “jumps in the agglomeration schedule based on distance coefficients were examined” (Gifford *et al.*, 2012:51). This was done by calculating the change in agglomeration coefficients from one cluster to another (Gifford *et al.*, 2012). Four clusters were identified by the scree plot, supported by a non-hierarchical two-step cluster analysis. In Table 8.1 the researcher presents the cluster means, *V*-values and *SD*-values for five socio-demographic variables from which the clusters were generated. Homogeneity was checked using *F*-values, and *t*-values were calculated to identify over- or underrepresentation of variables within the clusters. The clusters, overall, are homogenous.

Cluster 1 is a predominantly male cluster (70%) from the coloured community (82%). This cluster is composed of individuals with lower levels of education with low incomes. Individuals from the second cluster is all from the African sample (100%) and more or less equally male (52%) and female (48%). Similar to cluster 1, this cluster has lower levels of education. Cluster 2 also has the lowest level of income of less than R4 000 (94%). Cluster 3 and 4 both consist predominantly of the white population's sample (82% and 98% respectively). Cluster 3 is mainly males (90%) from higher income households with higher levels of education. The fourth cluster consists only of females (100%) with higher levels of education and higher incomes. Age did not differ across the clusters.

Table 8.1. Clusters generated from five socio-demographic variables with item means (*t* values) and variance

		Cluster 1: Male, low income and less educated (<i>n</i> = 60, 31.4%)		Cluster 2: Male and female, low income and less educated (<i>n</i> = 30, 17.3%)		Cluster 3: Male, high income and highly educated (<i>n</i> = 50, 26.2%)		Cluster 4: Female, high income and highly educated (<i>n</i> = 48, 25.1%)		
Socio-demographic variables		<i>M</i>	<i>V</i>	<i>M</i>	<i>V</i>	<i>M</i>	<i>V</i>	<i>M</i>	<i>V</i>	<i>SD</i>
Gender	Male	0.70	0.21	0.52	0.29	0.90	0.09	0.00	0.00	0.50
	Female	0.30	0.21	0.48	0.26	0.10	0.09	1.00	0.00	0.50
Population group	White	0.02	0.02	0.00	0.00	0.82	0.15	0.98	0.21	0.50
	African	0.15	0.13	1.00	0.00	0.14	0.12	0.02	0.21	0.44
	Coloured	0.82	0.15	0.00	0.00	0.04	0.04	0.00	0.00	0.44
Age	18–29	0.05	0.05	0.24	0.19	0.28	0.21	0.06	0.06	0.35
	30–39	0.20	0.16	0.12	0.11	0.06	0.06	0.23	0.18	0.37
	40–49	0.17	0.14	0.24	0.19	0.14	0.12	0.23	0.18	0.39
	50–59	0.20	0.16	0.18	0.15	0.14	0.12	0.15	0.13	0.37
	60–69	0.22	0.17	0.15	0.13	0.12	0.11	0.17	0.14	0.37
	70+	0.03	0.03	0.06	0.06	0.24	0.19	0.10	0.10	0.31
Income	Less than R4 000	0.22	0.17	0.94	0.06	0.08	0.08	0.02	0.02	0.43
	R4 000–R 16 5000	0.28	0.22	0.00	0.00	0.18	0.15	0.00	0.00	0.34
	R16 501–R 57 000	0.07	0.06	0.00	0.00	0.48	0.26	0.50	0.26	0.45
	R57 000+	0.00	0.00	0.00	0.00	0.14	0.12	0.21	0.17	0.29
Education	None to primary school	0.17	0.14	0.36	0.24	0.00	0.00	0.00	0.00	0.32
	Grade 9	0.27	0.20	0.33	0.23	0.02	0.02	0.04	0.04	0.37
	High School	0.32	0.22	0.24	0.19	0.08	0.08	0.17	0.14	0.40
	FET	0.13	0.12	0.03	0.03	0.12	0.11	0.13	0.11	0.31
	Tertiary	0.08	0.08	0.03	0.03	0.78	0.18	0.65	0.23	0.49

Results from Chapter 6 indicate that females, more so than males, perceived environmental problems as more serious. The results also indicated that the white population perceived environmental problems as more serious than the coloured and African populations. The income of a respondent also played a role in how seriously environmental problems were perceived, with the highest two income classes seeing environmental issues as more serious. As with the income classes, education levels affected how seriously an individual perceived an

environmental problem: the more educated an individual, the more seriously the environmental problems were perceived.

The results from the cluster analysis were able to support the findings regarding socio-demographic influences on the seriousness of environmental problems. Clusters 3 and 4 perceived eight environmental problems as more serious than clusters 1 and 2 (Table 8.2). This was similar to the previous results that white individuals, with higher household incomes and higher education levels view these problems as more serious.

Table 8.2. Cluster influences on environmental problems (*m*)

Clusters	Water scarcity (<i>n</i> = 191) (<i>F</i> (191) = 15.977, <i>df</i> = 3, <i>p</i> < 0.05)	Habitat destruction (<i>n</i> = 191) (<i>F</i> (191) = 2.740, <i>df</i> = 3, <i>p</i> < 0.05)	Overfishing (<i>n</i> = 191) (<i>F</i> (191) = 7.746, <i>df</i> = 3, <i>p</i> < 0.05)	Fresh water pollution (<i>n</i> = 191) (<i>F</i> (191) = 5.034, <i>df</i> = 3, <i>p</i> < 0.05)
1: Male, low income and less educated (<i>n</i> = 60, 31.4%)	3.52 ^b	2.87 ^a	2.83 ^b	3.18 ^{ab}
2: Male and female, low income and less educated (<i>n</i> = 30, 17.3%)	2.82 ^a	2.70 ^{ab}	2.00 ^a	2.91 ^a
3: Male, high income and highly educated (<i>n</i> = 50, 26.2%)	3.74 ^{bc}	3.10 ^{ab}	3.16 ^b	3.48 ^{bc}
4: Female, high income and highly educated (<i>n</i> = 48, 25.1%)	3.85 ^c	3.31 ^b	3.10 ^b	3.58 ^c
Clusters	Ocean pollution (<i>n</i> = 191) (<i>F</i> (191) = 10.893, <i>df</i> = 3, <i>p</i> < 0.05)	Wildlife poaching (<i>n</i> = 191) (<i>F</i> (191) = 14.438, <i>df</i> = 3, <i>p</i> < 0.05)	Species endangerment (<i>n</i> = 191) (<i>F</i> (191) = 9.132, <i>df</i> = 3, <i>p</i> < 0.05)	Climate change (<i>n</i> = 191) (<i>F</i> (191) = 5.421, <i>df</i> = 3, <i>p</i> < 0.05)
1: Male, low income and less educated (<i>n</i> = 60, 31.4%)	2.45 ^a	2.70 ^b	2.18 ^a	3.27 ^a
2: Male and female, low income and less educated (<i>n</i> = 30, 17.3%)	2.06 ^a	1.82 ^a	2.39 ^a	2.79 ^b
3: Male, high income and highly educated (<i>n</i> = 50, 26.2%)	3.08 ^b	3.20 ^c	3.04 ^b	3.34 ^b
4: Female, high income and highly educated (<i>n</i> = 48, 25.1%)	3.42 ^b	3.44 ^c	3.27 ^b	3.60 ^b

a, b, c Post Hoc test results

The results from the cluster analysis support the previous findings from Chapter 6 about which sources are used to access information about the environment, and which parts of the population uses them. As with the

findings in the previous chapter, the cluster analysis showed that cluster 2, consisting only of African individuals, uses television more than the other clusters to access information (Table 8.3).

Clusters 3 and 4 used online sources to get information sources about the environment more than the other three clusters (Table 8.3). Again, this supported previous findings: white, more educated individuals with a higher income use online sources to gain information about the environment, more than other parts of the population.

Books were used more by cluster 4 than the other clusters to gain information about the environment and environmental problems (Table 8.3). This, again, supported findings in previous chapters that books are used more by the white part of the population, than the other population groups in the population.

It has also been found that cluster 2 used national campaigns to gain information about the environment more than the other clusters. This supported previous findings that the African population used this source more to get information about the environment than the other population groups.

Table 8.3. Cluster influences on information sources

Clusters	Television (<i>n</i> = 191) (<i>F</i> (191) = 4.190, <i>df</i> = 3, <i>p</i> < 0.05)	Online sources (<i>n</i> = 191) (<i>F</i> (191) = 7.113, <i>df</i> = 3, <i>p</i> < 0.05)	Books (<i>n</i> = 191) (<i>F</i> (191) = 2.845, <i>df</i> = 3, <i>p</i> < 0.05)	National campaigns (<i>n</i> = 191) (<i>F</i> (191) = 2.760, <i>df</i> = 3, <i>p</i> < 0.05)
1: Male, low income and less educated	2.43 ^a	2.07 ^a	1.63 ^a	1.63 ^a
2: Male and female, low income and less educated	3.27 ^b	1.88 ^a	1.91 ^{ab}	2.12 ^b
3: Male, high income and highly educated	2.48 ^a	2.90 ^b	1.98 ^{ab}	1.60 ^a
4: Female, high income and highly educated	2.52 ^a	2.67 ^b	2.31 ^b	1.85 ^{ab}

^{a, b, c} Post Hoc test results

The cluster analysis for environmental knowledge also supported previous findings where white, higher educated individuals with higher income have more knowledge about the environment, than the other parts of the population. Clusters 3 and 4 are more knowledgeable about the environment and environmental problems than the other clusters (Table 8.4).

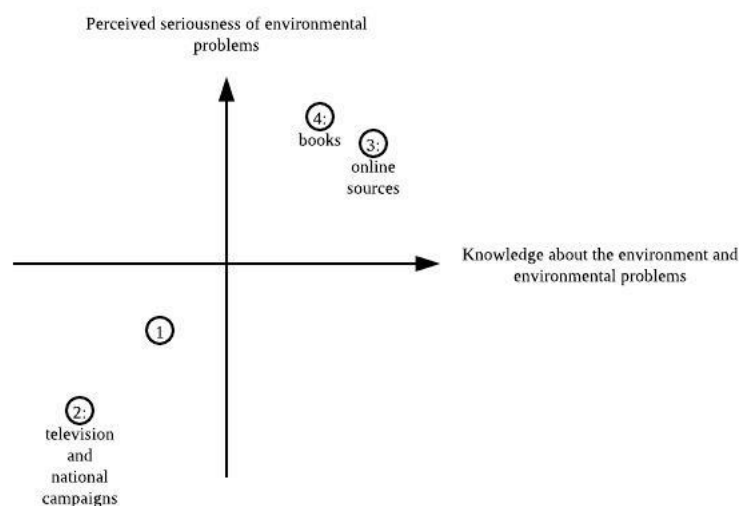
Table 8.4. Cluster influences on environmental knowledge

Clusters	Knowledge (<i>M</i>) (<i>n</i> = 191) (<i>F</i> (191) = 23.308, <i>df</i> = 3, <i>p</i> < 0.05)
1: Male, low income and less educated	0.77 ^b
2: Male and female, low income and less educated	0.66 ^a
3: Male, high income and highly educated	0.91 ^c
4: Female, high income and highly educated	0.90 ^c

a, b, c Post Hoc test results

8.2.2. Stellenbosch publics

From the results it was evident that clusters 3 and 4 perceive environmental problems as more serious than clusters 1 and 2. Clusters 3 and 4 were also more knowledgeable about the environment and environmental problems (Figure 8.1). Figure 8.1 indicates the information sources that were used the most by a cluster in comparison to the other clusters.

**Figure 8.1. Visual representation of clusters**

The clusters present in different publics in Stellenbosch and the measured results (environmental perceptions and knowledge) in previous chapters were used to identify and name different publics. Results from the

qualitative analysis were included further to expand on the publics and their perceptions about the environment and environmental challenges.

Public 1: “*Inbetweeners*” ($n = 60$, 31.4%): Compared to the other clusters, this public has moderately low levels of environmental knowledge and is not so concerned about environmental problems. This public is divided into 70% male and 30% female, mainly coloured individuals ($n = 49$) and have low levels of income and education.

However, even with low levels of concern for the environment, some respondents in this public stated that:

“People don't have respect for the environment,” “people take it for granted,” “people don't care” and “they [people] really don't look after our town”

Another respondent stated that:

“They [people from the community] don't look after our town, they really don't look after our town.”

When asked about water saving, one respondent from this public stated that she argues with other residents in the area:

“You know it's difficult in this house, the way we do it down here. We have students upstairs. I argue every day with them about wasting water and all the wrong things that they do. They don't know about wasting [or] saving.”

However, some respondents were aware that people and overpopulation are responsible for environmental degradation and that people need to be made aware of environmental problems:

“Environmental education is very important.”

“The changes I have seen are the huge amount of development that is happening in our town. For me that is overpopulation.”

Public 2: “*Least knowledgeable and concerned*” ($n = 30$, 17.3%): This public is the least concerned about the environment and environmental problems, and also is the least knowledgeable about the environment and environmental issues. This public consists of both African males and females and has the lowest education and income levels of the clusters. All the respondents in this public also live in an under serviced neighbourhood. This public used television and national campaigns to get informed about the environment, more so than the other three publics.

The respondents in this public were only able to mention and discuss a few problems when asked to name environmental problems South Africa might be experiencing, which was less than the other three publics. The drought in the Western Cape was mentioned, along with population increase and littering.

“I know about the water shortage here in [the] Western Cape” and “obviously we are not experiencing enough rain.”

“There is a lot of people here in Kayamandi” and “[the] population is increasing.”

Many also did not understand the questions regarding ‘natural environmental problems’, indicating a lack of environmental knowledge.

“There is a lack of [employment]”

“[...] regarding community safety”

Even though the individuals in this public were aware that people can be responsible for environmental change, and that environmental issues can pose a threat for the future, they were not able to express much concern for the environment.

“People have no respect for [the environment].”

However, a respondent stated that more can be done by the government in the informal area in which the respondent from this cluster is residing, indicating that these residents are not very educated on environmental issues:

“[...] not everyone is educated in terms of environmentally friendly products and usage. They just know about them, but they, it doesn't go on, like, all day long in their heads. So, we need to, like, post each and every corner of the [...] street there must be a sign or something, uhm, signage just to remind us that we are in an environment which we need to protect. And that we need to keep clean and recycle. So, we need something that will help us. Actually, advertise more on the environmental issues.”

Another individual stated that there is a scarcity of environmental awareness, and campaigns to create environmental awareness:

“[...] that there's a shortage of awareness. Like now, there's a water problem, but if you can go in here, in Kayamandi, there's no billboards, there's no boards that is showing save water or something.”

Public 3: “Knowledgeable” ($n = 50$, 56.2%): This public is the most knowledgeable about the environment and perceives environmental problems as very serious. This public had a generally high household income, has the highest level of education of all the publics and is predominantly male. This public also tends to use online sources, more so than the other publics, to access information about the environment. It seems that in this public high environmental knowledge corresponds with high household income and high levels of education.

When asked about environmental problems that South Africa faced, this public was able to give more examples of environmental problems, and reasons for these problems, than the other three publics. A highly educated (PhD), retired gentleman from an upper-class neighbourhood stated:

“There are hopelessly too many people. You see hopelessly too many natural areas that are nowadays being chopped up for housing and industry.”

Similarly, another retired gentleman said:

“To start off with, there are too many people on earth. [...] it is a whole chain reaction. One needs to generate more energy, for more people, to maintain more factories [...]. So, there are a hell of consequences.”

A third, younger, male student likewise stated that the main problem in Stellenbosch is the increase in population.

Many respondents from this public also mentioned pollution, especially plastic pollution:

“[...] basic things like, like people who throw litter all over. The pollution of the rivers.”

“It is impossible. It's a done deal. If you want something, you have to take it with the packaging. We bought a new TV last week. You won't believe how much cardboard and polystyrene comes with it. Like the bottles and tins in which your groceries come.”

“If you talk of plastic, yes absolutely. The pollution [...]”

White males were also able to provide more reasons for environmental change, mainly blaming bad management strategies.

“[...] it is purely bad management.”

“I can't understand why long-term planning does not exist. I don't understand it.”

This more knowledgeable public also discussed pro-environmental behaviour and activities with a positive environmental impact more frequently than the other three publics. Water saving (even before the water shortage), reduced electricity usage and recycling activities were mentioned frequently, as well as spending time outdoors.

“And the shower also. People talk about saving water, but my wife and I were accustomed to showering. You turn the shower on, you wet yourself, you turn it off, you soap yourself, you rinse off. It [has been] years since I have been doing it. It's not a new thing.”

“And of course, electricity ... we are accustomed to using the minimum electricity. If you don't use a room, then the lights are not on ... and so on.”

“We are recyclers, even long before it became the proper thing to do. Yes, we separate the items. All these years we took it away to Paul Roos. [...] we make compost. If a thing can rot, I make compost from it.”

Even though the cluster analysis indicated that this public used the Internet more often than the other publics to access information about the environment, only two individuals indicated using online sources. Newspapers were mentioned the most:

“I look at what is going on in the newspapers. Newspaper articles.”

Public 4: “*Concerned*” ($n = 45$, 25.1%): This public is highly knowledgeable about the environment and the most concerned about environmental problems, compared to the other publics. This public consists of only females, has the highest household income of the publics but slightly lower levels of education than public 3. It seems like with public 4, being concerned for the environment is correlated to high household income and high levels of education. This public also used books more than the other publics to get information about the environment:

“[...] it is from books.”

“Books and magazines.”

Analysis of the interviews indicated that this public showed more concern for the environment than the other three publics. When asked if South Africans should be worried about their influence on the environment, a 75-year old female said that:

“I think more than many other countries, we have a big problem.”

Another younger female, stated that she thinks South Africans need to be worried about the impact of environmental problems in the future:

“Especially because I’m a mother ... then one thinks ... the impact it has now. How will it be for your children and grandchildren?”

Other respondents expressed concern that a large part of the South African population is not aware of environmental problems at all:

“[...] the slow development of awareness.”

“I think the greater majority of the population has no awareness at all of nature [...]. I think it should come from, and I feel very passionate about it, it should actually be included in a school curriculum. So that it is imprinted in a child from a young age to be more aware of the environment.”

However, one respondent did mention that she thinks more can be done to improve awareness of environmental problems in South Africa:

“We can do more than we... I think the human is a very adaptable being. And I think we can... we have seen now with the water. We can save water. So, I think we can also improve in other areas.”

8.3. Discussion

The findings reveal that the population in Stellenbosch, South Africa, could be divided into four different publics. Two publics (3 and 4), *Knowledgeable* and *Concerned*, that were more knowledgeable about the environment and environmental problems and perceived environmental problems as more serious than the other two publics (1 and 2), *Least knowledgeable and concerned* and *Inbetweeners*. Publics 3 and 4 were also more concerned about environmental problems. Publics 3 and 4 with high knowledge about the environment

were Caucasian, had higher levels of education, and made use of the Internet and books to access information about the environment. With the exception of overfishing, public 4, a completely female public, considered all environmental problems as more serious than the other publics. It has been previously found that women are more concerned about the environment than men (Diekmann & Preisendörfer, 1998; Schultz, 2000; Vicente-Molina *et al.*, 2018).

Similar to these results, as early as 1980 it has been observed that higher educated people are more concerned about the environment (Jones & Dunlap, 1992; Van Liere & Dunlap, 1980). More recently, similar results have been observed in a Chilean city (Bronfman, Cisternas, López-Vázquez, De la Maza & Oyanedel, 2015). Just as with public 3 and 4, Chinese and Indian residents with an education level higher or equal to a college degree are more environmentally concerned than those without college degrees, as individuals from public 1 and 2 (Rajapaksa *et al.*, 2018; Shen & Saijo, 2008). Highly educated individuals may think that they can control some parts of the environment and may therefore, more likely to be concerned about the environment and environmental challenges (Raudsepp, 2001).

Income can influence general education, which may include environmental knowledge, as well as directly influence environmental behaviours (Díaz-Sieffer, Neaman, Salgado, Celis-Diez & Otto, 2015). In addition, a survey in Shanghai shows that the high household income has a positive effect on environmental concern (Shen & Saijo, 2008).

There was a significant effect of environmental action knowledge on pro-environmental behaviour (Díaz-Sieffer *et al.*, 2015). When individuals gain more knowledge about environmental issues, it leads them to change attitudes toward these matters, which in turn can result in pro-environmental behaviour (Paço & Lavrador, 2017).

Publics 1 and 2 had less knowledge about the environment, and were less concerned about the environment. These publics consisted of either African or coloured people and had lower levels of education and household incomes. Public 2 has the least knowledge about the environment and all respondents in this public lived in conditions close to that of an informal settlement, Kayamandi. Data collection in 2012 shows that there are no environmental community activist groups in Kayamandi. The local municipality, schools and two other groups do educate individuals on littering and recycling, but environmental education and communication does not stretch further than that (Du Plessis, Heineken & Olivier, 2012).

Publics who live in informal settlements are also less likely to have the same resources as other parts of the public, so they are less likely to be educated. Therefore, they may be less concerned about environmental degradation (Rajapaksa *et al.*, 2018). This can be explained in terms of South Africa's past. During apartheid, the natural environment was seen as exclusive to the white part of the population. This and the socio-economic differences between the population groups can explain why the African and coloured populations may display less concern towards the environment (Struwig, 2010). Public 2 also used television more than the other publics to gain access about the environment and environmental problems.

Neither one of these publics perceived an environmental problem as more serious than publics 3 and 4. Poverty can alter the attitude of an individual towards the environment: some individuals are “simply too poor to actually change their behaviour or give up material or financial resources for environmental protection and improvement” (Zeelie, 2003:45). However, public 1 did view the problems as more serious than public 2. It has previously been observed in South Africa that coloured individuals are more concerned about the environment than African individuals (Struwig, 2010). Middle income can also influence individual environmental concern although the effect will most likely be smaller than that of a high income group (Shen & Saijo, 2008). Public 1 has a slightly higher mean income than public 2.

8.4. Conclusion

This dissertation confirmed distinctions between publics by environmental concern and environmental knowledge and provided support for individual differences in environmental perceptions. Population group, gender, education and income correlated with how concerned an individual might be about the environment. Population group, education and income correlated with the knowledge an individual has regarding environmental problems. Lower educated people of colour with lower income levels were found to be less knowledgeable about the environment and also less concerned. Caucasians with higher education and income levels were more concerned and knowledgeable about the environment and environmental problems, with females being even more concerned than men.

Chapter 9: Conclusions, limitations and recommendations

9.1. Introduction

The dissertation was inspired and motivated by an absence of research about the public's environmental perceptions in a developing country, South Africa. The purpose of this research was to determine these perceptions the South African public has about the environment and environmental challenges. Perceptions of the environment at local level can potentially play a role to identify global environmental vulnerability and suggest solutions for reducing negative environmental impact (Steel, 1996).

These perceptions were analysed with regards to the seven research questions. In short, environmental perceptions are may be influenced by many factors and several important conclusions can be drawn from the results. In his final chapter the researcher will summarise these findings: the factors predicting perceptions about the environment, environmental knowledge and the sources interviewees use to get information about the environment. The researcher also discusses the limitations of this study and recommendations for future research.

9.2. Conclusions

There is an interest among policy makers, local governments, the private sector and scientists to develop effective environmental communication strategies and programmes (Martino, 2008). This goal can be reached by determining the public's perceptions about the environment. Perceptions should help determine management of environmental conservation policies.

The research presented in this dissertation contributes to both methods and substance with regard to environmental perceptions. Methodologically, the research provides evidence that the examination and analysis of environmental perceptions is feasible in a developing country setting. The survey instrument obtained valuable results about specific environmental challenges.

The first research questions examined the environmental perceptions of citizens of a town in the Western Cape, South Africa. Taken together, the survey results confirm the notion that socio-demographic variables may play a role in creating perceptions about the environment and environmental issues of the Stellenbosch public. This public also perceived water shortage, climate change and water pollution to be the most severe environmental issues the Stellenbosch community, and South Africa, faced at the time of the research. However, many citizens from the lower income communities did not understand the term 'natural environment.'

The second research question explored what socio-demographic variables may influence a South African public's perceptions about the environment, confirming 4 out of 6 hypotheses. The research indicated that some socio-demographic variables can explain the high proportion of variance of environmental perceptions of individuals. Gender, population group, education and the household income of an individual had strong correlations with the environmental perceptions of the population.

Females perceived environmental challenges as more serious than men. The white population group viewed environmental problems as more serious than the African and coloured samples of the population. Both education and household income are positively related to environmental perceptions: higher education levels and higher incomes lead to individuals perceiving environmental problems as more serious.

Therefore, this research confirmed some findings from previous studies, including that female, Caucasian individuals with higher education and higher income levels perceived environmental challenges as more serious and tend to be more concerned about the environment and environmental degradation. Therefore, this part of the population has more accurate perceptions, more knowledge and greater awareness of environmental problems, when compared to other parts of the population.

A regression analysis indicated that the strongest predictors of environmental concern is being a Caucasian female and high levels of environmental knowledge, indicating that socio-demographic factors play a less important role than knowledge about the environment, answering research question six.

The third research question asked which sources individuals used to gain access to information about the environment and become more knowledgeable. Most Stellenbosch citizens have access to environmental information sources and the results revealed that the sample uses television the most to gain access to environmental information, confirming the first hypothesis. This is followed by personal sources, such as family and friends, and newspapers.

The survey results indicated that population group, age, education and income level influence the information source the population used to get information about the environment. Younger interviewees make more use of online sources, personal sources and the radio. Older, middle-aged interviewees make more use of national campaigns to get informed about the environment.

African individuals watched television and listened to the radio for information about the environment, while the white sample made more use of books, online sources and formal sources. Higher educated individuals made use of television, online sources and newspapers to access information about the environment. Individuals without income used the radio more than the higher income interviewees and the income group with the highest income made most use of online source.

The results indicate that self-reported knowledge and measured (actual) knowledge about the environment was relatively high for the sample public, answering RQ 4. It also indicated that Caucasians with higher education levels and higher incomes are more knowledgeable about the environment, confirming the second hypothesis. The strong relationship between formal education and perceptions and knowledge, may suggest that knowledge can also influence perceptions as seen in the regression analysis's best model fit. There is also a correlation between information sources and environmental knowledge.

These results can be summarised in a revised theoretical model for the Stellenbosch public (Figure 9.1). Socio-demographics that correlate with perceptions about the environment were gender, population group, education

and income. White females with higher education and higher income levels perceived environmental problems as more serious and had more concern for the environment. Similarly, sub-populations with higher education and higher levels of income viewed environmental problems as more serious and also had the highest knowledge of environmental problems.

Population group, age, education and income also correlates with the information sources used by the sample, even though the sample mainly uses television to access information about the environment. The sample had high self-reported knowledge of the environment and high actual knowledge. This knowledge together with population group are the strongest predictors of environmental perceptions, with white female, knowledgeable individuals perceiving environmental problems as most serious.

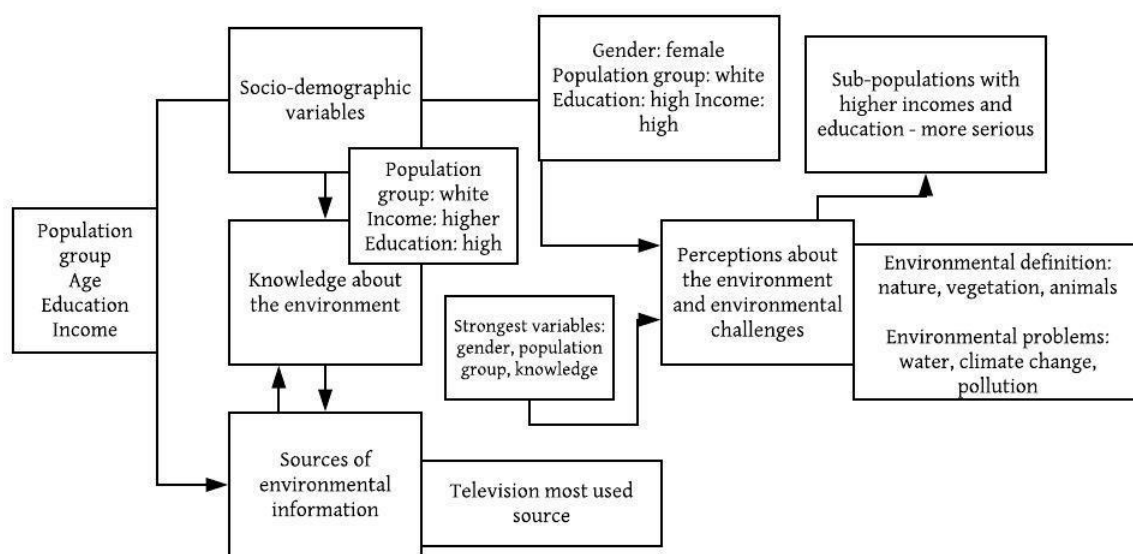


Figure 9.1 Revised theoretical model for Stellenbosch environmental perceptions, information sources and environmental knowledge

Consequently, there is a need to create public awareness and concern for certain parts of the researched South African population. Creating it would require formal and informal communication strategies (Ifegbesan & Rampedi, 2018). There should be clear specific proposals for dealing with and becoming engaged in the struggle with environmental problems. The results from this dissertation should be applied to the design and application of environmental communication programmes.

More education and communication are needed for ordinary people in developing countries to develop concern for the environment and create and maintain sustainable relationships between the public and the environment (Myung, 2017). It is needed to educate and teach individuals to act in the best interest of the environment (Zareie & Jafari Navimipour, 2016). The focus should be on educating individuals that are not concerned. With effective communication and quality service provision environmental concern can increase and consequently pro-environmental behaviour could become the norm (Barr, 2003).

Programmes and campaigns need to be created to promote the environmental knowledge necessary to achieve this environmental concern and consequently, pro-environmental behaviour (Rajapaksa *et al.*, 2018), but also to make the public aware of governmental and private environmental actions. However, environmental issues will not be solved solely by the improvement of people's knowledge, unless the relevant authorities take the appropriate actions to find the solution, create policies, allocate resources and pay the costs of environmental degradation (Noorhosseini *et al.*, 2017; Wang & Cheng, 2017). Environmental communication should focus less on the actual science and more on raising awareness about environmental issues and promoting environmentally friendly behaviour (Davis, Fährnrich, Nepote & Riedlinger, 2018).

Coloured and black men with low levels of education and average incomes should be targeted, as the results indicate that these sub-population groups do not perceive environmental problems as very serious. Women's views should also be incorporated into conservation efforts (Martino, 2008), as they show more concern for the environment.

The results specify that a lot of information comes from the media or private interest groups in environmental issues. "The media should therefore be used more intensively to facilitate the transmission of environmental information and promote concern for the environment" (Önder, 2006, p. 351). The government should therefore take significant action regarding environmental challenges: to make the public more knowledgeable about environmental issues, by providing the right information and news through the media.

Information and marketing campaigns should aim to enhance the public's environmental concern, to address the advantages of environmental protection as precisely and as close to an individual's life as possible (Best & Mayerl, 2013). It is important to implement communication programmes in vulnerable areas, as residents in these areas tend to deal with the adverse impacts of environmental degradation the most (Haq & Ahmed, 2017).

An environmental problem should be analysed in the local and social system in which it takes place. Therefore, when designing a policy, an intervention or a campaign, it is important to address a specific environmental behaviour, but at the same time place it in a larger context of environmental conservation for the public (Best & Mayerl, 2013).

The right information source should also be used to reach the right public. Individuals with less knowledge about the environment and that perceived environmental problems as less serious, should be reached through television, radio, formal governmental sources and national campaigns, as these are the sources they use most often. Non-formal environmental communication through these sources should be used "more widely and frequently to inform the public about environment problems" (Sudarmadi *et al.*, 2001:169). More detailed information on the environment should be provided to literate people through newspapers, television, and online sources.

9.3. Limitations and recommendations for future research and environmental communication

The results and findings are based on the environmental concern measures applied in this dissertation. Therefore, future studies could employ improved measures, values, attitudes post-materialism, New Ecological Paradigm Scale, and environmental behaviour (Beckett, 2013; Clements, 2012; De Groot & Steg, 2007; Haring *et al.*, 2017; Inglehart, 1995; Mobley *et al.*, 2010; Myung, 2017; Shen & Saijo, 2008) – for environmental concern to help ensure the validity of the findings. Pre-defined quota plans should be employed to better represent the Stellenbosch population (Guenther *et al.*, 2018).

Variables at one point in time might not predict environmental perceptions at another point in time, therefore a longitudinal study should be conducted over a longer time period. Research can also include the public's perceptions of local versus global environmental challenges and concepts.

This study is indicative of numerous areas for continued research. However, limitations do exist. One such limitation revolves around the nature of the sample, which came from a single urban metropolitan area (Brewer & Ley, 2013) and is only representative of the Stellenbosch community. The Stellenbosch public only gives a limited representation of the country and continent. Therefore, the results may not generalise as well to publics across the country or in other countries (Brewer & Ley, 2013). It does not represent the demographic and societal structure of the entire South Africa (Bronfman *et al.*, 2015). There might be regional differences regarding the issue of environmental concern. The public's perceptions of the environment should be tested again with a larger sample size (Guenther *et al.*, 2018).

Because a mixed-method research design has not been used for a South African population before, confirmation is needed for the results concerning socio-demographic differences and the influence of knowledge. Further investigation should be done in order to take into account the cultural or geographical differences, this should incorporate other cities and towns in South Africa (Bronfman *et al.*, 2015). It is necessary to use samples from other urban and rural areas (Shen & Saijo, 2008) throughout the country to determine the environmental concern for the entire South African population. The length of residence of a interviewees should also be taken into account (Anderson *et al.*, 2007). Furthermore, it is worth noting that the research was based on self-reporting data and even though this method is widely used, caution should be exercised as accepting it as actual (Bronfman *et al.*, 2015). It is important to note that the pressure or need to appear socially and environmentally concerned during surveys and interviews may lead to individuals to overstate their concern for the environment.

The researcher also suggests further research in areas vulnerable to different environmental challenges. It is also necessary to sample high and low-income households from all population groups. Future research should include known environmentally concerned individuals (e.g. volunteers from environmental NGOs). This will allow researchers better to understand the motivations behind environmental concern and pro-environmental

behaviour (Levy *et al.*, 2018). Support for specific environmental policy measures should also be considered in future research.

The lack of many respondents' understanding about the natural environment can be cleared up by providing a clear definition of what is asked of them. The impact of self-reported and measured environmental knowledge on environmental problems should be measured separately. The role of socio-demographic variables and pro-environmental behaviour can be included in future research.

This study also focused on the respondents' use of information sources, and not in what way the issues are portrayed and framed in the media (Anderson, 2015; Burke *et al.*, 2015). This allows for future research in this field and the various actors involved in environmental communication. Future research could explore the relationship between environmental knowledge and information sources in more depth.

Regardless of these limitations, this dissertation does propose valuable conclusions for understanding public perceptions of the natural environment and environmental perceptions, as well as the role of the information sources and knowledge in forming those perceptions in reference to socio-demographic variables. The dissertation ultimately shows that the theoretical framework developed in Stellenbosch, South Africa is helpful in explaining environmental perceptions and the development of environmental concern in the Western Cape. It can also be argued that the relationships determined in this research can be applied beyond the Western Cape in South Africa and a wider set of developing countries (White & Hunter, 2009)

Conflict of interest

The author declares that there are no conflicts of interest.

References

- Abdulkarim, B., Yacob, M.R., Abdullah, A.M. & Radam, A. 2017. Farmers' perceptions and attitudes toward forest watershed conservation of the North Selangor Peat Swamp Forest. *Journal of Sustainable Forestry*, 36(4): 1–15.
- Adams, R. & Adeleke, F. 2016. Assessing the potential role of open data in South African environmental management. *The African Journal of Information and Communication*, 19: 79–99.
- Adams, S. & Savahl, S. 2015. Children's perceptions of the natural environment: A South African perspective. *Children's Geographies*, 13(2): 196–211.
- Adelle, C. & Withana, I.S. 2008. Transatlantic platform for action on the global environment (T-PAGE)¹: EU and US public perceptions of environmental, climate change and energy issues. Institute for European Environmental Policy.
- Alibeli, M. & White, N. 2011. The structure of environmental concern. *International Journal of Business and Social Science*, 2(4): 1–8.
- Almeida, J.A.S., Barbosa, L.M.S., Pais, A.A.C.C. & Formosinho, S.J. 2007. Improving hierarchical cluster analysis: A new method with outlier detection and automatic clustering. *Chemometrics and Intelligent Laboratory Systems*, 87(2): 208–217.
- Alp, E., Ertepinar, H., Tekkaya, C. & Yilmaz, A. 2006. A statistical analysis of children's environmental knowledge and attitudes in Turkey. *International Research in Geographical and Environmental Education*, 15(3): 210–223.
- Alyaz, Y., Öztürk, A. O. & Genç, Z.S. 2017. Contribution of an environmental documentary movie on the development of pre-service teachers' environmental attitudes. *Humanitas*, 5(9): 203–218.
- Aminrad, Z., Zakaria, S.Z.B.S. & Hadi, A.S. 2011. Influence of age and level of education on environmental awareness and attitude. *The Social Sciences*, 6(1): 15–19.
- Anderson, A. 1991. Source strategies and the communication of environmental affairs. *Media, Culture & Society*, 13(4): 459–476.
- Anderson, A. 2015. Reflections on environmental communication and the challenges of a new research agenda. *Environmental Communication*, 9(3): 379–383.
- Anderson, B.A., Romani, J.H., Phillips, H., Wentzel, M. & Tlabela, K. 2007. Exploring environmental perceptions, behaviors and awareness: Water and water pollution in South Africa. *Population and Environment*, 28: 133–161.
- Anderson, B. A., Romani, J.H., Wentzel, M. & Phillips, H. 2013. Recycling behavior among urban South Africans: The role of race and social status.
- Anderson, B.A., Wentzel, M., Romani, J. & Phillips, H. 2010. Exploring environmental consciousness in South Africa. *Population Studies Center Research Report*:10–709.
- Anderson, W. & Cunningham, W.H. 1972. The socially conscious consumer. *Journal of Marketing*, 36(3): 23–31.
- Anthony, B. 2007. The dual nature of parks: Attitudes of neighbouring communities towards Kruger National Park, South Africa. *Environmental Conservation*, 34(3): 236–245.
- Anthony, R. 1982. Polls, pollution and politics: Trends in public opinion on the environment. *Environment*, 24(4): 14–34.

- Arbuthnot, J. & Linng, S. 1975. A comparison of French and American environmental behaviors. *International Journal of Psychology*, 10(4): 275–281.
- Arcury, T.A. 1990. Environmental attitude and environmental knowledge. *Human Organization*, 49(4): 300–304.
- Arendt, F. & Matthes, J. 2016. Nature documentaries, connectedness to nature, and pro-environmental behavior. *Environmental Communication*, 10(4): 453–472.
- Armah, F.A., Yengoh, G.T., Luginaah, I., Chuenpagdee, R., Hambati, H. & Campbell, G. 2015. Monitored versus experience-based perceptions of environmental change: Evidence from coastal Tanzania. *Journal of Integrative Environmental Sciences*, 12(2): 119–152.
- Arnocky, S., Stroink, M. & DeCicco, T. 2007. Self-construal predicts environmental concern, cooperation, and conservation. *Journal of Environmental Psychology*, 27(4): 255–264.
- Axelrod, L.J. & Lehman, D.R. 1993. Responding to environmental concerns: What factors guide individual action? *Journal of Environmental Psychology*, 13: 149–159.
- Bai, M., Dixon, J., Williams, A., Jeon, S., Lazenby, M. & McCorkle, R. 2016. Exploring the individual patterns of spiritual well-being in people newly diagnosed with advanced cancer: A cluster analysis. *Quality of Life Research*, 25(11): 2765–2773.
- Bakuwa, J. 2015. Public understanding of global climate change in Malawi: An investigation of factors influencing perceptions, attitudes and beliefs about global climate change. Stellenbosch University. Unpublished Doctoral dissertation.
- Balderjahn, I. 1988. Personality variables and environmental attitudes as predictors of ecologically responsible consumption patterns. *Journal of Business Research*, 17: 51–56.
- Ballantyne, R. & Oelofse, C. 1999. Informal settlers' perceptions of environmental quality: A case study of the Mizamoyethu Community, South Africa. *The Environmentalist*, 19: 203–215.
- Balzer, T. 2016. The impact of the drought on water provision: Presentation to the Western Cape Drought Dialogue. Cape Town.
- Bamberg, S. 2003. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology*, 23: 21–32.
- Barber, J., Biddlecom, A.E. & Axinn, W.G. 2003. Neighborhood social change and perceptions of environmental degradation. *Journal of Population and Environment*, 25(2): 77–108.
- Bardsley, D.K. & Edwards-Jones, G. 2007. Invasive species policy and climate change: social perceptions of environmental change in the Mediterranean. *Environmental Science and Policy*, 10: 230–242.
- Barkan, S.E. 2004. Explaining public support for the environmental movement: A civic voluntarism model. *Social Science Quarterly*, 85(4): 913–937.
- Barr, S. 2003. Strategies for sustainability: Responsible environmental citizens and behaviour. *Area*, 35(3): 227–240.
- Barr, S. & Gilg, A. 2006. Sustainable lifestyles: Framing environmental action in and around the home. *Geoforum*, 37(6): 906–920.
- Barreiro, P.L. & Albandoz, J.P. 2001. Population and sample. Sampling techniques. *Management Mathematics for European Schools*. Seville. University of Seville. Retrieved from https://optimierung.mathematik.uni-kl.de/mamaesch/veroeffentlichungen/ver_texte/sampling_en.pdf [Accessed 30 August 2017].

- Beardmore, B. 2015. Boater perceptions of environmental issues affecting lakes in Northern Wisconsin. *Journal of the American Water Resources Association*, 51(2): 537–549.
- Beckett, S.E. 2013. Environmental concern, race and socio-economic status in post-apartheid South Africa, 1996–2006. Stellenbosch University. Unpublished MA thesis.
- Bennett, N.J. 2016. Using perceptions as evidence to improve conservation and environmental management. *Conservation Biology*, 30(3): 582–592.
- Bennett, N.J., Roth, R., Klain, S.C., Chan, K., Christie, P., Clark, D.A., Cullman, G., Curran, D., Durbin, T.J., Epstein, G., Greenberg, A., Nelson, M.P., Sandlos, J., Stedman, R., Teel, T.L., Thomas, R. Veríssimo, D. & Wyborn, C. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation*, 205: 93–108.
- Berenguer, J., Corraliza, J.A. & Martin, R. 2005. Rural-urban differences in environmental concern, attitudes, and actions. *European Journal of Psychological Assessment*, 21(2): 128–138.
- Berger, G. 2002. Environmental journalism meets the 21st century. *Intermedia*, 30(5): 8–11.
- Berger, I.E. 1997. The demographics of recycling and the structure of environmental behavior. *Environment and Behavior*, 29(4): 515–525.
- Besley, J.C. 2008. Media use and human values. *J & MC Quarterly*, 85(2): 311–330.
- Besley, J.C. 2015. Making environmental communication work: Creating useful guidance. *Environmental Communication*, 9(3): 398–403.
- Besley, J.C. & Shanahan, J. 2004. Skepticism about media effects concerning the environment: examining Lomborg's Hypotheses. *Society & Natural Resources*, 17(10): 861–880.
- Best, H. & Mayerl, J. 2013. Values, beliefs, attitudes: An empirical study on the structure of environmental concern and recycling participation. *Social Science Quarterly*, 94(3): 691–714.
- Bewket, W. 2012. Climate change perceptions and adaptive responses of smallholder farmers in central highlands of Ethiopia. *International Journal of Environmental Studies*, 69(3): 507–523.
- Bi, J., Zhang, Y. & Zhang, B. 2010. Public perception of environmental issues across socioeconomic characteristics: A survey study in Wujin, China. *Frontiers of Environmental Science and Engineering in China*, 4(3): 361–372.
- Bickerstaff, K. & Walker, G. 2001. Public understandings of air pollution: The “localisation” of environmental risk. *Global Environmental Change*, 11(2): 133–145.
- Biel, A. & Nilsson, A. 2005. Religious attitudes and environmental concern: Harmony and detachment. *Social Science Quarterly*, 86(1): 178–191.
- Bird, D.K. 2009. The use of questionnaires for acquiring information on public perception of natural hazards and risk mitigation – A review of current knowledge and practice. *Natural Hazards and Earth System Sciences*, 9(4): 1307–1325.
- Blake, D.E. 2001. Contextual effects on environmental attitudes and behavior. *Environment and Behavior*, 33(5): 708–725.
- Blake, J. 1999. Overcoming the ‘value-action gap’ in environmental policy: Tensions between national policy and local experience. *Local Environment*, 4(3): 257–278.
- Blewitt, J. 2011. Critical practice and the public pedagogy of environmental and conservation media. *Environmental Education Research*, 17(6): 719–734.

- Blocker, T.J. & Eckberg, D.L. 1989. Environmental issues as women's issues: General concerns and local hazards. *Social Science Quarterly*, 70(3): 586–593.
- Blocker, T.J. & Eckberg, D.L. 1997. Gender and environmentalism: Results from the 1993 general social survey. *Social Science Quarterly*, 78(4): 841–858.
- Bloom, D.E. 1995. International public opinion on the environment. Columbia University. Discussion paper.
- Bord, R.J., Fisher, A. & O'Connor, R.E. 1998. Public perceptions of global warming: United States and international perspectives. *Climate Research*, 11(1): 75–84.
- Boykoff, M.T. 2009. We speak for the trees: Media reporting on the environment. *Annual Review of Environment and Resources*, 34(1): 431–457.
- Brand South Africa. 2013. The press in South Africa. Retrieved November 21, 2017, from <https://web.archive.org/web/20131210222004/http://www.southafrica.info/about/media/news.htm#.WhPXE0qWY2x> [Accessed 21 November 2017].
- Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2): 77–101.
- BRC (The Broadcasting Research Council of South Africa). 2017a. BRC RAMS update August 2017.
- BRC (The Broadcasting Research Council of South Africa). 2017b. BRC RAMS update May 2017.
- BRC (The Broadcasting Research Council of South Africa). 2017c. BRC TAMS update October 2017.
- Brechin, S.R. & Kempton, W. 1994. Global environmentalism: A challenge to the postmaterialism thesis? *Social Science Quarterly*, 75(2): 245–269.
- Brewer, J.F. 2009. Public participation in environmental assessment and decision making. Washington, DC: The National Academic Press.
- Brewer, P.R. & Ley, B.L. 2013. Whose science do you believe? Explaining trust in sources of scientific information about the environment. *Science Communication*, 35(1): 115–137.
- Brody, S.D., Zahran, S., Vedlitz, A. & Grover, H. 2008. Examining the relationship between physical vulnerability and public perceptions of global climate change in the United States. *Environment and Behaviour*, 40(1): 72–95.
- Bronfman, N.C., Cisternas, P.C., López-Vázquez, E., De la Maza, C. & Oyanedel, J.C. 2015. Understanding attitudes and pro-environmental behaviors in a Chilean community. *Sustainability*, 7(10): 14133–14152.
- Brulle, R.J. 2010. From environmental campaigns to advancing the public dialog: Environmental communication for civic engagement. *Environmental Communication*, 4(1): 82–98.
- Bryman, A. 2012. *Social research methods*. Fourth edition. Oxford. Oxford University Press.
- Buckley, P.J., Pinnegar, J.K., Painting, S.J., Terry, G., Chilvers, J., Lorenzoni, I., Gelcich, S. & Duarte, C.M. 2017. Ten thousand voices on marine climate change in Europe: Different perceptions among demographic groups and nationalities. *Frontiers in Marine Science*, 4: 1–17.
- Bun Lee, E. 2008. Environmental attitudes and information sources among African American college students. *The Journal of Environmental Education*, 40(1): 29–42.
- Burger, J., Roush, D.E., Sanchez, J., Ondrof, J., Ramos, R., McMahon, M.J. & Gochfeld, M. 2000. Attitudes and perceptions about ecological resources, hazards, and future land use of people living near the Idaho National Engineering and Environmental Laboratory. *Environmental Monitoring and Assessment*, 60: 145–161.

- Burke, B.J., Welch-Devine, M., Gustafson, S., Rice, J.L., Gragson, T.L. & Evans, S.R. 2016. Can science writing collectives overcome barriers to more democratic communication and collaboration? Lessons from environmental communication praxis in Southern Appalachia. *Environmental Communication: A Journal of Nature and Culture*, 10(3): 169-186.
- Burningham, K. & O'Brien, M. 1994. Global environmental values and local contexts of action. *Sociology*, 28(4): 913-932.
- Burns, T.W., O'Connor, D.J. & Stocklmayer, S.M. 2003. Science communication: A contemporary definition. *Public Understanding of Science*, 12(2): 183-202.
- Buttel, F.H. & Flinn, W.L. 1978. Social class and mass environmental beliefs: a reconsideration. *Environment and Behavior*, 10(3): 433-450.
- Cambridge Dictionaries. 2016. Cambridge Dictionary. Retrieved from <http://dictionary.cambridge.org/> [Accessed 8 June 2016].
- Campbell, C.J. & Cooke, R.U. 1971. Public perceptions of environmental quality in Tucson, Arizona. *Journal of the Arizona Academy of Sciences*, 6(4): 260-274.
- Cantrill, J.G. 1998. The environmental self and a sense of place: Communication foundations for regional ecosystem management. *Journal of Applied Communication Research*, 26(3): 301-318.
- Capstick, S., Whitmarsh, L., Poortinga, W., Pidgeon, N.F. & Upham, P. 2015. International trends in public perceptions of climate change over the past quarter century. *Wiley Interdisciplinary Reviews: Climate Change*, 6(1): 35-61. 21
- Caracelli, V.J. & Greene, J.C. 1993. Data analysis strategies for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 15(2): 195-207.
- Carducci, A., Donzelli, G., Cioni, L., Palomba, G., Verani, M., Mascagni, G., Anastasi, G., Pardini, L., Ceretti, E., Grassi, T., Carraro, E., Bonetta, S., Villarini, M. & Gelatti, U. 2017. Air pollution: A study of citizen's attitudes and behaviors using different information sources. *Epidemiology Biostatistics and Public Health*, 14(2): 1-9.
- Carlson, D.H. 2004. Environmental concern in South Africa: The development of a measurement scale. University of South Africa. Unpublished MSc thesis
- Carmi, N. 2013. Caring about tomorrow: Future orientation, environmental attitudes and behaviors. *Environmental Education Research*, 19(4): 430-444.
- Carvalho, A. 2007. Ideological cultures and media discourses on scientific knowledge: Re-reading news on climate change. *Public Understanding of Science*, 16(2): 223-243.
- Carvalho, A. 2009. Communication for sustainable policy: Connecting science, society and government. *Science for Environmental Policy: Special Issue*, 17(1): 1-8.
- Carvalho, D.S. & Fidélis, T. 2009. Confronting environmental perceptions of local populations and local authorities. *Management of Environmental Quality: An International Journal*, 20(5): 538-550.
- Casey, P.J. & Scott, K. 2006. Environmental concern and behaviour in an Australian sample within an ecocentric - Anthropocentric framework. *Australian Journal of Psychology*, 58(2): 57-67.
- Chan, K. 1998. Mass communication and pro-environmental behaviour: Waste recycling in Hong Kong. *Journal of Environmental Management*, 52: 317-325.
- Chanda, R. 1996. Human perceptions of environmental degradation in a part of the Kalahari ecosystem. *GeoJournal*, 39(1): 65-71.

- Chanda, R. 1999. Correlates and dimensions of environmental quality concern among residents of an African subtropical city: Gaborone, Botswana. *The Journal of Environmental Education*, 30(2): 31–39.
- Chen, X., Peterson, M.N., Hull, V., Lu, C., Lee, G.D., Hong, D. & Liu, J. 2011. Effects of attitudinal and sociodemographic factors on pro-environmental behaviour in urban China. *Environmental Conservation*, 38(1): 45–52.
- Cheung, L.T.O., Fok, L., Tsang, E.P.K., Fang, W. & Tsang, H.Y. 2015. Understanding residents' environmental knowledge in a metropolitan city of Hong Kong, China. *Environmental Education Research*, 21(4): 507–524.
- Cilliers, J. & Aucoin, C. 2016. Economics, governance and instability in South Africa. Institute for Security Studies, 293: 24. City of Cape Town. 2017. City of Cape Town: Water Dashboard 24. Cape Town.
- Clark, C.F., Kotchen, M.J. & Moore, M.R. 2003. Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, 23(3): 237–246.
- Clements, B. 2012. The sociological and attitudinal bases of environmentally-related beliefs and behaviour in Britain. *Environmental Politics*, 21(6): 901–921.
- Cock, J. & Fig, D. 2001. The impact of globalisation on environmental politics in South Africa, 1990-2002. *African Sociological Review*, 5(2): 15–35.
- Condit, C.M. & Depoe, S. 1997. Environmental communication. *Critical Studies in Mass Communication*, 14(4): 367–372.
- Corral-Verdugo, V. 1997. Environmental dual 'realities' of conservation behavior: Self-reports vs observations of re-use and recycling behavior. *Journal of Environmental Psychology*, 17: 135–145.
- Cottrell, S.P. 2003. Influence of sociodemographics and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and Behavior*, 35(3): 347–375.
- Cottrell, S.P. & Graefe, A.R. 1997. Testing a conceptual framework of responsible environmental behavior. *The Journal of Environmental Education*, 29(1): 17–27.
- Cox, R. 2013. Study and practice of Environmental Communication. In *Environmental Communication and the Public Sphere*. Third edition. Sage, 11–38.
- Coyle, K. 2005. Understanding environmental literacy in America and making it a reality. National Environmental Education and Training Foundation, NEETF. Washington DC.
- Creswell, J.W. 2009. Research design: Qualitative, quantitative, and mixes methods approaches. Third edition. Thousand Oaks, CA. Sage.
- Creswell, J.W. & Clark, V.L.P. 2011. Desinging and conducting mixed methods research. Second edition. Thousand Oaks, CA. Sage.
- CSVR (The Centre for Study of Violence and Reconciliation). 2009. Why does South Africa have such high rates of violent crime? CSVR. Retrieved from http://www.csvr.org.za/archive/docs/study/7.unique_about_SA.pdf [Accessed 14 June 2018].
- Daniels, D.P., Krosnick, J.A., Tichy, M.P. & Tompson, T. 2013. Public opinion on environmental policy in the United States. In M. Kraft & S. Kamieniecki (eds.), *The Oxford handbook of U.S. environmental policy*. Oxford: Oxford University Press, 461-486.

- D'Antonio, A., Monz, C., Newman, P., Lawson, S. & Taff, D. 2012. The effects of local ecological knowledge, minimum-impact knowledge, and prior experience on visitor perceptions of the ecological impacts of backcountry recreation. *Environmental Management*, 50: 542–554.
- Dasgupta, S., Laplante, B. & Meisner, C. 2000. Environmental news in Argentina, Chile, Mexico and the Philippines. *Local Environment*, 5(3): 351–359.
- Davies, S.R. 2008. Constructing Communication: Talking to Scientists About Talking to the Public. *Science Communication*, 29(4): 413–434.
- Davis, L., Fähnrich, B., Nepote, A.C. & Riedlinger, M. 2018. Environmental communication and science communication — conversations, connections and collaborations. *Environmental Communication*, 12(4):1–7.
- De Beer, F. & Marais, M. 2005. Rural communities, the natural environment and development - Some challenges, some successes. *Community Development Journal*, 40(1): 50–61.
- DeChano, L.M. 2006. A multi-country examination of the relationship between environmental knowledge and attitudes. *International Research in Geographical and Environmental Education*, 15(1): 15–28.
- De Groot, J.I.M. & Steg, L. 2007. Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3): 330–354.
- De Lavega, E.L. 2004. Awareness, knowledge, and attitude about environmental education: Responses from environmental specialists, high school instructors, students, and parents. University of Central Florida. Unpublished Doctoral dissertation.
- Department of the Environment Food and Rural Affairs. 2005. The UK Government Sustainable Development Strategy. London, UK.
- Derksen, L. & Gartell, J. 1993. The social context of recycling. *American Sociological Review*, 58(3): 434–442.
- Diamantopoulos, A., Schlegelmilch, B.B., Sinkovics, R.R. & Bohlen, G.M. 2003. Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research*, 56(6): 465–480.
- Díaz-Sieffer, P., Neaman, A., Salgado, E., Celis-Diez, J.L. & Otto, S. 2015. Human-environment system knowledge: A correlate of pro-environmental behavior. *Sustainability*, 7(11): 15510–15526.
- Diekmann, A. & Franzen, A. 1999. The wealth of nations and the environment. *Environment and Behavior*, 31(4): 540–549.
- Diekmann, A. & Preisendörfer, P. 1998. Environmental behavior: Discrepancies between aspirations and reality. *Rationality and Society*, 10(1): 79–102. h
- Dietz, T., Stern, P.C. & Guagnano, G.A. 1998. Social structural and social psychological bases of environmental concern. *Environment and Behavior*, 30(4): 450–471.
- Dono, J., Webb, J. & Richardson, B. 2010. The relationship between environmental activism, pro-environmental behaviour and social identity. *Journal of Environmental Psychology*, 30(2): 178–186.
- Dow, K. 1992. Exploring differences in our common future(s): The meaning of vulnerability to global environmental change. *Geoforum*, 23(3): 417–436.

- Downs, G.M. & Barnard, J.M. 2003. Clustering methods and their uses in computational chemistry. In K.B. Lipkowitz & D.B. Boyd (eds.), *Reviews in computational chemistry* vol. 18. Hoboken: Wiley & Sons, 1–17.
- Driscoll, D.L., Salib, P. & Rupert, D.J. 2007. Merging qualitative and quantitative data in mixed methods research: How to and why not. *Ecological and Environmental Anthropology*, 3(1): 18–28.
- Duncker, L.C. & Gonçalves, D. 2017. Community perceptions and attitudes regarding wildlife crime in South Africa. *International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering*, 11(3): 172–178.
- Dunlap, R.E. 1989. Public opinion and environmental policy. In J.P. Lester (ed.), *Environmental politics and policy*. Durham, NC: Duke University Press, 120–130.
- Dunlap, R.E. 1994. International attitudes towards environment and development. In H. Bergesen & G. Parmann (eds.), *Green Globe yearbook of international co-operation on environment and development*. Oxford: Oxford University Press, 115–126.
- Dunlap, R.E. 2017. Environmental behaviour and attitudes in Europe in a historical and cross-cultural comparative perspective. In A. Telešienė & M. Gross (eds.), *Green European*. Oxon: Routledge, xix–xxvi.
- Dunlap, R.E., Gallup, G.H. Jr & Gallup, A.M. 1993. Of global concern: results of the Health of the Planet Survey. *Environment*, 35(9): 6–39.
- Dunlap, R.E. & Jones, R.E. 2002. Environmental concern: conceptual and measurement issues. In R. E. Dunlap & W. Michelson (eds.), *Handbook of environmental Sociology*. Westport: Greenwood Press, 482–425.
- Dunlap, R.E. & Van Liere, K.D. 1978. The “new environmental paradigm.” *The Journal of Environmental Education*, 9(1): 10–19.
- Du Plessis, J., Heineken, L. & Olivier, D. 2012. Community needs assessment and asset mapping profile of Kayamandi. Stellenbosch: University of Stellenbosch.
- Eden, S. 1996. Public participation in environmental policy: Considering scientific, counter-scientific and non-scientific contributions. *Public Understanding of Science*, 5(3): 183–204.
- Eden, S. 1998. Environmental issues: Knowledge, uncertainty and the environment. *Progress in Human Geography*, 22(3): 425–432.
- Effective Measure. 2017. Insights: South Africa Online – October 2017. Retrieved from <http://blog.effective measure.com/south-africa-online-october-2017> [Accessed 8 January 2018].
- Eisler, A.D., Eisler, H. & Yoshida, M. 2003. Perception of human ecology: Cross-cultural and gender comparisons. *Journal of Environmental Psychology*, 23 89–101.
- Esengun, K., Sayili, M. & Akca, H. 2006. Perceptions of environmental issues in a Turkish province. *Polish Journal of Environmental Studies*, 15(4): 635–642.
- Everitt, B.S. 2018. Unresolved problems in cluster analysis. *Biometrics*, 35(1): 169–181.
- Fakier, S., Stephens, A., Tholin, J. & Kapelus, P. 2005. National state of the environment project: Background research paper produced for the South Africa Environment Outlook report on behalf of the Department of Environmental Affairs and Tourism. Retrieved from http://soer.deat.gov.za/dm_documents/Environmental_Governance_-_Background_Paper_WU45Q.pdf [Accessed 16 May 2016].

- Falk, J.H. 2005. Free-choice environmental learning: framing the discussion. *Environmental Education Research*, 11(3): 265–280.
- Fawzi, R., Ameen, M. & Mourshed, M. 2017. Urban environmental challenges in developing countries - A stakeholder perspective. *Habitat International*, 64: 1–10.
- Feindt, P.H. & Oels, A. 2005. Does discourse matter? Discourse analysis in environmental policy making. *Journal of Environmental Policy & Planning*, 7(3): 161–173.
- Fink, A. & Kosecoff, J. 1998. *How to conduct surveys: A step-by-step guide*. Second edition. Thousand Oaks CA: Sage.
- Fishbein, M. & Ajzen, I. 2010. *Predicting and changing behavior: The reasoned action approach*. New York, NY: Taylor and Francis Group.
- Fransson, N. & Gärling, T. 1999. Environmental concern: Conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology*, 19(4): 369–382.
- Franzen, A. 2003. Environmental attitudes in international comparison: An analysis of ISSP surveys 1993 and 2000. *Social Science Quarterly*, 84(2): 297–308.
- Franzen, A. & Meyer, R. 2010. Environmental attitudes in cross-national perspective: A multilevel analysis of the ISSP 1993 and 2000. *European Sociological Review*, 26(2): 219–234.
- Franzen, A. & Vogl, D. 2013. Two decades of measuring environmental attitudes: A comparative analysis of 33 countries. *Global Environmental Change*, 23(5): 1001–1008.
- Frick, J., Kaiser, F.G. & Wilson, M. 2004. Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences*, 37(8): 1597–1613.
- Fryxell, G.E. & Lo, C.W.H. 2003. The influence of environmental knowledge and values on managerial behavior in China: A comparison of managers in Guangzhou and Beijing. *Journal of Business Ethics*, 46: 45–69.
- García-Mira, R., Real, J.E. & Romay, J. 2005. Temporal and spatial dimensions in the perception of environmental problems: An investigation of the concept of environmental hyperopia. *International Journal of Psychology*, 40(1): 5–10.
- Gelissen, J. 2007. Explaining popular support for environmental protection: A multilevel analysis of 50 nations. *Environment And Behavior*, 39(3): 392–415.
- Giannoulis, C., Botetzagias, I. & Skanavis, C. 2010. Newspaper reporters' priorities and beliefs about environmental journalism: An application of Q-methodology. *Science Communication*, 32(4): 425–466.
- Gifford, E.V., Tavakoli, S., Weingardt, K.R., Finney, J.W., Pierson, H.M., Rosen, C.S., Hagedorn, H.J., Cook, J.M. & Curran, G.M. 2012. How do components of evidence-based psychological treatment cluster in practice?. A survey and cluster analysis. *Journal of Substance Abuse Treatment*, 42(1): 45–55.
- Gifford, R. & Nilsson, A. 2014. Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, 49(3): 141–57.
- Gifford, R., Steg, L. & Reser, J.P. 2011. Environmental psychology. In P. Martin, F. Cheung, M. Knowles, M. Kyrios, L. Littlefield, J.B. Overnier & J.M. Prieto (eds.), *IAAP handbook of applied psychology*. Chichester, UK: Blackwell, 440–470.
- Gioli, G., Khan, T. & Scheffran, J. 2014. Climatic and environmental change in the Karakoram: Making sense of community perceptions. *Regional Environmental Change*, 14: 1151–1162.

- Gökşen, F., Adaman, F. & Zenginobuz, E.Ü. 2002. On environmental concern, willingness to pay, and postmaterialist values: Evidence from Istanbul. *Environment and Behavior*, 34(5): 616–633.
- Goodman, M.K., Littler, J., Brockington, D. & Boykoff, M.T. 2016. Spectacular environmentalisms: Media, knowledge and the framing of ecological politics. *Environmental Communication*, 10(6): 677–688.
- Greeley, A. 1993. Religion and attitudes toward the environment. *Journal for the Scientific Study of Religion*, 32(1): 19–28.
- Greenberg, M. 2005. Environmental protection as a US national government priority: Analysis of six annual public opinion surveys, 1999-2004. *Journal of Environmental Planning and Management*, 48(5): 733–746; 733.
- Griffin, R.J. & Dunwoody, S. 1997. Community structure and science framing of news about environment. *Science Communication*, 18(4): 362–384.
- Groffman, P.M., Stylinski, C., Nisbet, M.C., Duarte, C.M., Jordan, R., Burgin, A., Previtali, M.A. & Cary, J.C. 2010. Restarting the conversation: Challenges at the interface between ecology and society. *Frontiers in Ecology and the Environment*, 8(6): 284–291.
- Guber, D.L. 1996. Environmental concern and the dimensionality problem: A new approach to an old predicament. *Social Science Quarterly*, 77(3): 28–29.
- Guenther, L. & Weingart, P. 2018. Promises and reservations towards science and technology among South African publics: A culture-sensitive approach. *Public Understanding of Science*, 27(1): 47–58.
- Guenther, L., Weingart, P. & Meyer, C. 2018. “Science is everywhere, but no one knows it”: Assessing the cultural distance to science of rural South African publics. *Environmental Communication*: 1–16
- Guth, J.L., Green, J.C., Kellstedt, L.A. & Smidt, C.E. 1995. Faith and the environment: Religious beliefs and attitudes on environmental policy. *American Journal of Political Science*, 39(2): 364–382.
- Guthiga, P.M. 2008. Understanding local communities’ perceptions of existing forest management regimes of a Kenyan rainforest. *International Journal of Social Forestry*, 1(2): 145–166.
- Halford, G.S. & Sheehan, P.W. 1991. Human response to environmental changes. *International Journal of Psychology*, 26(5): 599–611.
- Hamilton, L.C. & Duncan, C.M. 2010. Place effects on environmental views. *Rural Sociology*, 75(2): 326–347.
- Hand, C.M. & Van Liere, K. 1984. Religion, mastery-over-nature, and environmental concern. *Social Forces*, 63(2): 555–570.
- Hansen, A. 1991. The media and the social construction of the environment. *Media, Culture & Society*, 13: 444–458.
- Hansen, A. 2011. Communication, media and environment: Towards reconnecting research on the production, content and social implications of environmental communication. *International Communication Gazette*, 73(1/2): 7–25. 9
- Hansla, A., Gamble, A., Juliusson, A. & Gärling, T. 2008. The relationships between awareness of consequences, environmental concern, and value orientations. *Journal of Environmental Psychology*, 28(1): 1–9.
- Hao, F. 2014. The effect of economic affluence and ecological degradation on Chinese environmental concern: A multilevel analysis. *Journal of Environmental Studies and Sciences*, 4: 123–131.

- Haq, S.M.A. & Ahmed, K.J. 2017. Does the perception of climate change vary with the socio-demographic dimensions? A study on vulnerable populations in Bangladesh. *Natural Hazards*, 85(3): 1759–1785.
- Haron, S.A., Paim, L. & Yahaya, N. 2005. Towards sustainable consumption: An examination of environmental knowledge among Malaysians. *International Journal of Consumer Studies*, 29(5): 426–436.
- Harring, N., Jagers, S. & Matti, S. 2017. Public support for pro-environmental policy measures: Examining the impact of personal values and ideology. *Sustainability*, 9(5): 1–14.
- Harrison, C.M., Burgess, J. & Filius, P. 1996. Rationalizing environmental responsibilities: A comparison of lay publics in the UK and the Netherlands. *Global Environmental Change*, 6(3): 215–234.
- Hayball, F., McCrorie, P., Kirk, A., Gibson, A.M. & Ellaway, A. 2018. Exploring children’s perceptions of their local environment in relation to time spent outside. *Children and Society*, 32(1): 14–26.
- Heberlein, T.A. 1981. Environmental attitudes. *Zeitschrift fur Umweltpolitik*, 2: 241–270.
- Henry, A.D. 2000. Public perceptions of global warming. *Research in Human Ecology*, 7(1): 25–30.
- Henry, D.B., Tolan, P.H. & Gorman-Smith, D. 2005. Cluster analysis in family psychology research. *Journal of Family Psychology*, 19(1): 121–132.
- Hine, D.W., Reser, J.P., Morrison, M., Phillips, W.J., Nunn, P. & Cooksey, R. 2014. Audience segmentation and climate change communication: Conceptual and methodological considerations. *Wiley Interdisciplinary Reviews: Climate Change*, 5(4): 441–459.
- Hines, J.M., Hungerford, H.R. & Tomera, A.N. 1987. Analysis and Synthesis of Research on Responsible Env Behavior.pdf. *The Journal of Environmental Education*, 18(2): 1–8.
- Hiramatsu, A., Kurisu, K. & Hanaki, K. 2016. Environmental consciousness in daily activities measured by negative prompts. *Sustainability*, 8(24): 1–19.
- Holbert, R.L., Kwak, N. & Shah, D.V. 2003. Environmental concern, patterns of television viewing, and pro-environmental behaviours: Integrating models of media consumption and effects. *Journal of Broadcasting & Electronic Media*, 47(2): 177–196.
- Holl, K.D., Daily, G.C. & Ehrlich, P.R. 1995. Knowledge and Perceptions in Costa Rica regarding environment , population , and biodiversity ssues. *Conservation Biology*, 9(6): 1548–1558.
- Hu, D., Urlie, J., Yuan, D. & Xiao, H. 2002. Perceptions and values: citizen perspectives on environment in South China. China. Unpublished final research paper, NSF/CWU Program in Asia-Pacific Studies, Central Washington University, Ellensburg, Washington, DC
- Huang, H. 2016. Media use, environmental beliefs, self-efficacy, and pro-environmental behavior. *Journal of Business Research*, 69: 2206–2212.
- Huddart-Kennedy, E., Beckley, T.M., McFarlane, B.L. & Nadeau, S. 2009. Rural-urban differences in environmental concern in Canada. *Rural Sociology*, 74(3): 309–329.
- Hungerford, H.R. & Volk, T.L. 1990. Changing learner behavior through environmental education. *Journal of Environmental Education*, 21(3): 8–21.
- Hunter, L.M., Hatch, A. & Johnson, A. 2004. Cross-national gender variation in environmental behaviors. *Social Science Quarterly*, 85(3): 677–694.
- Hunter, L.M., Strife, S. & Twine, W. 2010. Environmental perceptions of rural South African residents: The complex nature of environmental concern. *Society & Natural Resources*, 23(6): 525–541.

- Iachan, R. 1982. Systematic sampling: A critical review. *International Statistical Review/Revue Internationale de Statistique*, 50(3): 293–303.
- Ifegbesan, A.P. & Rampedi, I.T. 2018. Understanding the role of socio-demographic and geographical location on pro-environmental behavior in Nigeria. *Applied Environmental Education & Communication*: 1–17.
- IndexMundi. 2016. South Africa Demographics Profile 2016. Retrieved from http://www.indexmundi.com/south_africa/demographics_profile.html [Accessed 13 October 2016].
- IndexMundi. 2018. South Africa environment - current issues. Retrieved from https://www.indexmundi.com/south_africa/environment_current_issues.html [Accessed 14 June 2018].
- Infield, M. 1988. Attitudes of a rural community towards conservation and a local conservation area in Natal, South Africa. *Biological Conservation*, 45: 21–46.
- Inglehart, R. 1977. Long term trends in mass support for European unification. *Government and Opposition*, 12 (2): 150–177.
- Inglehart, R. 1995. Public support for environmental protection: Objective problems and subjective values in 43 societies. *Political Sciences and Politics*, 28(1): 57–72.
- Ingold, T. 2000. *The perception of the environment: Essays on livelihood, dwelling and skill*. London: Routledge.
- Ito, H. & Kawazoe, N. 2017. The associations between socio-demographic factors and environmental knowledge in the city of Toyota, Japan. *Applied Environmental Education & Communication* 17(3): 1–14.
- Ivankova, N.V., Creswell, J.W. & Stick, S.L. 2006. Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods*, 18(1): 3–20.
- Jacobson, S.K. & Mcduff, M.D. 2017. Training idiot savants: The lack of human dimensions in conservation biology, 12(2): 263–267.
- Jain, S.K. & Kaur, G. 2006. Role of socio-demographics in segmenting and profiling green consumers. *Journal of International Consumer Marketing*, 18(3): 107–146.
- Janpol, H.L. & Dilts, R. 2016. Does viewing documentary films affect environmental perceptions and behaviors? *Applied Environmental Education & Communication*, 15(1): 90–98.
- Jarreau, P.B., Altinay, Z. & Reynolds, A. 2015. Best practices in environmental communication: A case study of Louisiana's coastal crisis. *Environmental Communication*, 11(2): 1–23.
- Jefferson, R.L., Bailey, I., Laffoley, D.d'A., Richards, J.P. & Attrill, M.J. 2014. Public perceptions of the UK marine environment. *Marine Policy*, 43: 327–337.
- Johnson, C.Y., Bowker, J.M. & Ken Cordell, H. 2004. Ethnic variation in environmental belief and behavior: An examination of the new ecological paradigm in a social psychological context. *Environment and Behavior*, 36(2): 157–187.
- Johnson, R.B. & Onwuegbuzie, A.J. 2004. Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7): 14–26.
- Johnson, R.J. & Scicchitano, M.J. 2000. Uncertainty, risk, trust, and information: Public perceptions of environmental issues and willingness to take action. *Policy Studies Journal*, 28(3): 633–947.
- Jones, R.E. & Dunlap, R.E. 1992. The social bases of environmental concern: Have they changed over time? *Rural Sociology*, 57(1): 28–47.

- Kaiser, F.G. 1998. A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28(5): 395–422.
- Kaiser, F.G. & Wilson, M. 2000. Assessing people's general ecological behavior: cross-cultural measure. *Journal of Applied Social Psychology*, 30(5): 952–978.
- Kaiser, F.G., Wölfling, S. & Fuhrer, U. 1996. Environmental attitude and ecological behaviour. Paper presented at the Annual Meeting of the American Psychological Association. Toronto, Canada, 1–65
- Kalof, L. 1998. Understanding the social construction of environmental concern. *Human Ecology Review*, 4(2): 101–105.
- Kanagy, C.L. & Nelsen, H.M. 1995. Religion and environmental concern: Challenging the dominant assumptions. *Review of Religious Research*, 37(1): 33–45.
- Kangalawe, R.Y.M. 2012. Land degradation, community perceptions and environmental management implications in the drylands of Central Tanzania. In S. Curkovic (ed.), *Sustainable development: Authoritative and leading edge content for environmental management*. Rijeka: InTech, 539–560.
- Kaoje, A.U., Sabir, A.A., Yusuf, S., Jimoh, A.O. & Raji, M.O. 2017. Residents' perception of solid waste disposal practices in Sokoto, Northwest Nigeria. *African Journal of Environmental Science and Technology*, 11(2): 94–102.
- Kassing, J.W., Johnson, H.S., Kloeber, D.N. & Wentzel, B.R. 2010. Development and validation of the environmental communication scale. *Environmental Communication*, 4(1): 1–21.
- Kearns, F.R. 2012. From science communication to relationship-building: Contemplative practice and community engagement in the environmental sciences. *Journal of Environmental Studies and Sciences*, 2(3): 275–277.
- Kemmelmeier, M., Król, G. & Kim, Y.H. 2002. Values, economics and proenvironmental attitudes in 22 societies. *Cross-Cultural Research*, 36(3): 256–285.
- King, K.E. 2014. Chicago residents' perceptions of air quality: Objective pollution, the built environment, and neighborhood stigma theory. *Population and Environment*, 37(1): 1–21.
- Klineberg, S.L., McKeever, M. & Rothenbach, B. 1998. Demographic predictors of environmental concern: It does make a difference how it's measured. *Social Science Quarterly*, 79(4): 734–753.
- Klintonberg, P., Seely, M. & Christiansson, C. 2007. Local and national perceptions of environmental change in central Northern Namibia: Do they correspond? *Journal of Arid Environments*, 69(3): 506–525.
- Kok, P., Collinson, M., Van Tonder, L., Roux, N. & Carenne, M. 2006. Migration and urbanization in South Africa. Report 03-04-02, Pretoria: Statistics South Africa
- Kolandai-Matchett, K. 2009. Improving News Media Communication of Sustainability and the Environment: An Exploration of Approaches. University of Canterbury. Unpublished Doctoral dissertation
- Kollmuss, A. & Agyeman, J. 2002. Mind the gap: Why do people behave environmentally and what are the barriers to pro-environmental behaviour? *Environmental Education Research*, 8(3): 239–260.
- Konisky, D.M., Milyo, J. & Richardson, L.E. Jr. 2008. Environmental policy attitudes: Issues, geographic scale, and political trust. *Social Science Quarterly*, 89(5): 1066–1085.
- Kovacs, J.M. 2000. Perceptions of environmental change in a tropical coastal wetland. *Land Degradation & Development*, 11: 209–220.
- Kuchinskaya, O. 2018. Connecting the dots: Public engagement with environmental data. *Environmental Communication*, 12(4): 495–506.

- Kulözü, N. 2016. Youths' perception and knowledge towards environmental problems in a developing country: In the case of Atatürk University, Turkey. *Environmental Science and Pollution Research*, 23(12): 12482–12490.
- Lacy, S., Riffe, D. & Varouhakis, M. 2007. Where do Ohioans get their environmental news ? *Newspaper Research Journal*, 28(1): 70–85.
- Ladd, E.C. & Bowman, K. 1996. International public opinion on the environment. *Resources*, 124: 5–7.
- Ladle, R.J., Jepson, P. & Whittaker, R.J. 2005. Scientists and the media: The struggle for legitimacy in climate change and conservation science. *Interdisciplinary Science Reviews*, 30(3): 231–240.
- Lai, J.C. & Tao, J. 2003. Perception of environmental hazards in Hong Kong Chinese. *Risk Analysis: An Official Publication of the Society for Risk Analysis*, 23(4): 669–684.
- Langlois, E. 2012. Factors that shape environmental perceptions: Role of health and place. University of New Orleans. Retrieved from <http://scholarworks.uno.edu/td/1595/> [Accessed 25 November 2016]. Unpublished MSc dissertation.
- Leach, M. & Mearns, R. 1996. Environmental change and policy. In *The Lie of the Land: Challenging Received Wisdom on the African Environment*. Oxford: James Currey, 1–33.
- Lehohla, P. 2017. Poverty Trends in South Africa: An examination of absolute poverty between 2006 and 2011. Pretoria: Statistics South Africa
- Lester, L. 2010. Media and the environment. Cambridge: Polity Press.
- Levine, D.S. & Strube, M.J. 2012. Environmental attitudes, knowledge, intentions and behaviors among college students. *The Journal of Social Psychology*, 152(3): 308–326.
- Levy, A., Orion, N. & Leshem, Y. 2018. Variables that influence the environmental behavior of adults. *Environmental Education Research*, 24(3): 307–325.
- Levy-Leboyer, C., Bonnes, M., Chase, J., Ferreira-marques, J. & Pawlik, K. 1996. Determinants of pro-environmental behaviors: A five-countries comparison. *European Psychologist*, 1(2): 123–129.
- Li, Y. 2018. Study of the effect of environmental education on environmental awareness and environmental attitude based on environmental protection law of the People's Republic of China. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(6): 2277–2285.
- Liefländer, A.K. & Bogner, F.X. 2018. Educational impact on the relationship of environmental knowledge and attitudes. *Environmental Education Research*, 24, 611–624.
- Likens, G.E. 2010. The role of science in decision making: Does evidence-based science drive environmental policy? *Frontiers in Ecology and the Environment*, 8(6): 1–9.
- Liu, X. & Mu, R. 2016. Public environmental concern in China: Determinants and variations. *Global Environmental Change*, 37, 116–127.
- Liu, X., Vedlitz, A. & Shi, L. 2014. Examining the determinants of public environmental concern: Evidence from national public surveys. *Environmental Science & Policy*, 39, 77–94.
- Liu, X., Wu, Y., Hu, Y., Liu, D., Zhang, J., Chen, C., Yuan, Z. & Lu, Y. 2016. Government employees' perception of urban air pollution and willingness to pay for improved quality: A cross-sectional survey study in Nanchang, China. *Environmental Science and Pollution Research* 23(21): 22183–22189.
- Löfstedt, R.E. 1995. Why are public perception studies on the environment ignored? *Global Environmental Change*, 5(2): 83–85.

- Lomborg, B. 2001. Things are getting better. In B. Lomborg (ed.), *The skeptical environmentalist: Measuring the real state of the world*. Cambridge: Cambridge University Press, 3–32.
- Lubchenco, J. 1998. Entering the century of the environment: A new social contract for science. *Science*, 279: 491–497.
- Luchs, M.G. & Mooradian, T.A. 2012. Sex, personality, and sustainable consumer behaviour: Elucidating the gender effect. *Journal of Consumer Policy*, 35(1): 127–144.
- Macnaghten, P. & Jacobs, M. 1997. Public identification with sustainable development : Investigating cultural barriers to participation Public identification with sustainable development to. *Global Environmental Change*, 7(1): 5–24.
- Maestre-Andrés, S., Calvet-Mir, L. & Van den Bergh, J.C.J.M. 2016. Sociocultural valuation of ecosystem services to improve protected area management: A multi-method approach applied to Catalonia, Spain. *Regional Environmental Change*, 16: 717–731.
- Mainieri, T., Barnett, E.G., Valdero, T.R., Unipan, J.B. & Oskamp, S. 1997. Green buying: The influence of environmental concern on consumer behavior. *The Journal of Social Psychology*, 137(2): 189–204.
- Major, A.M. & Atwood, L.E. 2004. Environmental risks in the news: Issues, sources, problems, and values. *Public Understanding of Science*, 13(3): 295–308.
- Malka, A., Krosnick, J.A. & Langer, G. 2009. The association of knowledge with concern about global warming: Trusted information sources shape public thinking. *Risk Analysis*, 29(5): 633–647.
- Maloney, M.P. & Ward, M.P. 1973. Ecology: Let's hear from the people: An objective scale for the measurement of ecological attitudes and knowledge. *American Psychologist*, 28(7): 583–586.
- Markowitz, E.M., Goldberg, L.R., Ashton, M.C. & Lee, K. 2012. Profiling the “pro-environmental individual”: A personality perspective. *Journal of Personality*, 80(1): 81–111.
- Marquart-Pyatt, S.T. 2007. Concern for the environment among general publics: A cross-national study. *Society and Natural Resources: An International Journal*, 20(10): 883–898.
- Marquart-Pyatt, S.T. 2015. Public opinion about the environment: Testing measurement equivalence across countries. *International Journal of Sociology*, 45(4): 309–326.
- Martino, D. 2008. Gender and urban perceptions of nature and protected areas in Bañados del Este Biosphere Reserve. *Environmental Management*, 41(5): 654–662.
- Maslow, A.H. 1970. *Religions, values, and peak experiences*. New York, NY: Penguin.
- Mbewe, P. 2016. Determinants of environmental perceptions of rural inhabitants in Bushbukridge, South Africa. University of the Witwatersrand, Johannesburg. Unpublished MSc dissertation.
- McMillan, M., Hoban, T.J., Clifford, W.B. & Brant, M.R. 1997. Social and demographic influences on environmental attitudes. *Southern Rural Sociology*, 13(1): 89–107.
- McStay, J.R. & Dunlap, R.E. 1983. Male–female differences in concern for environmental quality. *International Journal of Women's Studies*, 6(4): 291–301.
- Mensah, S., Veldtman, R., Ephrem, A., Ham, C., Glèlè, R. & Seifert, T. 2017. Ecosystem service importance and use vary with socio-environmental factors: A study from household-surveys in local communities of South Africa. *Ecosystem Services*, 23: 1–8.
- Metag, J., Fuchslin, T. & Schäfer, M.S. 2017. Global warming's five Germanys: A typology of Germans' views on climate change and patterns of media use and information. *Public Understanding of Science*, 26(4): 434–451.

- Michalos, A., Creech, H., McDonald, C. & Kahkle, M.H. 2009. Measuring knowledge, attitudes and behaviours towards sustainable development: Two exploratory studies. Winnipeg: International Institute of Sustainable Development.
- Miller, T. & Pollak, T. 2013. Environmental coverage in the mainstream news: We need more. Retrieved from environmentalcoverage.org/ranking [Accessed 16 November 2016].
- Minton, A.P. & Rose, R.L. 1997. The effects of environmental concern on environmentally friendly consumer behavior: An exploratory study. *Journal of Business Research*, 40(96): 37–48.
- Mobley, C., Vagias, W.M. & DeWard, S.L. 2010. Exploring additional determinants of environmentally responsible behavior: The influence of environmental literature and environmental attitudes. *Environment and Behavior*, 42(4): 420–447.
- Mohai, P. 1990. Black environmentalism. *Social Science Quarterly*, 71(4): 744–765.
- Mohai, P. & Bryant, B. 1998. Is there a “race” effect on concern for environmental quality? *The Public Opinion Quarterly*, 62(4): 475–505.
- Mohai, P. & Twight, B.W. 1987. Age and environmentalism: An elaboration of the Buttel Model using national survey evidence. *Social Science Quarterly*, 68(4): 798–815.
- Møller, M., Haustein, S. & Bohlbro, M.S. 2018. Adolescents’ associations between travel behaviour and environmental impact: A qualitative study based on the Norm-Activation Model. *Travel Behaviour and Society*, 11: 69–77.
- Morrison, P.S. & Beer, B. 2017. Consumption and environmental awareness: Demographics of the European experience. *New Frontiers in Regional Science: Asian Perspectives* 24: 619–629.
- Mqadi, S. 2015. Five things that you need to know about radio in South Africa. *Vuvuzela*, 1 July. , Retrieved from <https://witsvuvuzela.com/2015/07/01/five-things-that-you-need-to-know-about-radio-in-south-africa/> [Accessed 21 November 2017].
- Murch, A.W. 1971. Public concern for environmental pollution. *The Public Opinion Quarterly*, 35(1): 100–106.
- Murray, N.P. & Hunfalvay, M. 2017. A comparison of visual search strategies of elite and non-elite tennis players through cluster analysis. *Journal of Sports Sciences*, 35(3): 241–246.
- Myung, E. 2017. Environmental knowledge, attitudes, and willingness to pay for environmentally friendly meetings - An exploratory study. *Journal of Hospitality and Tourism Management*, [In press]: 1–7.
- Nadkarni, N.M. 2002. When preaching to the choir isn’t preaching to the choir: Churches, trees , and environmental perspectives. *Environmental Practice*, 4(4): 188–190.
- Naidoo, N. 2005. Social Survey 2005: Stellenbosch Municipality (WC 24). Retrieved from <https://www.stellenbosch.gov.za/documents/socio-economic-data/216-2005-social-survey-final-report-feb-2006/file> [Accessed 20 March 2018].
- National Environmental Education and Training Foundation. 2000. Roper Report 2000: Lessons from the environment. Washington DC.
- Nelms, C., Allen, M.W., Craig, C.A. & Riggs, S. 2017. Who is the adolescent environmentalist? Environmental attitudes, identity, media usage and communication orientation. *Environmental Communication* 11(4): 1–17.
- Newell, S.J. & Green, C.L. 1997. Racial differences in consumer environmental concern. *The Journal of Consumer Affairs*, 31(1): 53–69.

- Newman, T.P. & Fernandes, R. 2016. A re-assessment of factors associated with environmental concern and behavior using the 2010 General Social Survey. *Environmental Education Research*, 22(2): 153–175.
- Nisbet, M.C. & Scheufele, D.A. 2009. What’s next for science communication? Promising directions and lingering distractions. *American Journal of Botany*, 96(10): 1767–1778.
- Nisbet, M.C., Scheufele, D.A., Shanahan, J., Moy, P., Brossard, D. & Lewenstein, B.V. 2002. Knowledge, reservations, or promise? A media effects model for public perceptions of science and technology. *Communication Research*, 29(5): 584–608+609.
- Noorhosseini, S.A., Allahyari, M.S., Damalas, C.A. & Moghaddam, S.S. 2017. Public environmental awareness of water pollution from urban growth: The case of Zarjub and Goharrud rivers in Rasht, Iran. *Science of the Total Environment*, 599/600: 2019–2025.
- NPC (National Planning Commission). 2011. National Development Plan 2030: Our future - make it work. The Presidency.
- Nyanga, P.H., Johnsen, F.H., Aune, J.B. & Kalinda, T.H. 2011. Smallholder Farmers’ Perceptions of Climate Change and Conservation Agriculture: Evidence from Zambia. *Journal of Sustainable Development*, 4(4): 73–85.
- O’Brien, S.R.M. 2007. Indications of environmental literacy: using a new survey instrument to measure awareness, knowledge, and attitudes of university-aged students. Iowa State University. Retrospective Thesis and Dissertations. Paper 15055: 1-113
- O’Connor, R.E., Bord, R.J. & Fisher, A. 1999. Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis*, 19(3): 461–471.
- OECD (Organisation for Economic Co-operation and Development). 1999. Environmental communication: Applying communication tools towards sustainable development. Danvers.
- Olli, E., Grendstad, G. & Wollebaek, D. 2001. Correlates of environmental behaviors: Bringing back social context. *Environment and Behavior*, 33(3): 181–208.
- Önder, S. 2006. A survey of awareness and behavior in regard to environmental issues among Selcuk University students in Konya, Turkey. *Journal of Applied Sciences* 6(2): 347-352.
- Onwuegbuzie, A.J. & Leech, N.L. 2004. Enhancing the interpretation of “significant” findings: The role of mixed methods research. *The Qualitative Report*, 9(4): 770–792.
- Onwuegbuzie, A.J. & Leech, N.L. 2006. Linking research questions to mixed methods data analysis procedures. *The Qualitative Report*, 11(3): 474–498.
- Oreg, S. & Katz-Gerro, T. 2006. Predicting proenvironmental behavior cross-nationally: Values, the theory of planned behavior, and value-belief-norm theory. *Environment and Behavior*, 38(4): 462–483.
- Ostman, R.E. & Parker, J.L. 1987. Impact of education, age, newspapers, and television on environmental knowledge, concerns, and behaviors. *Journal of Environmental Education*, 19(1): 3–9.
- Paço, A. & Lavrador, T. 2017. Environmental knowledge and attitudes and behaviours towards energy consumption. *Journal of Environmental Management*, 197: 384–392.
- Park, M.S. 2013. The dual role of the media in environmental communication as a public sphere and as political actors. *Forest Science and Technology*, 9(1):33–38.
- Park, S.O. & Yoon, S. 2017. The effects of taxpayer’s environmental morale on the willingness to pay environmental tax for sustainable environment. *International Journal of Applied Engineering Research*, 12(24): 14054–14063.

- Parker, J.D. & McDonough, M.H. 1999. Environmentalism of African Americans: An analysis of the subculture and barriers theories. *Environment and Behavior*, 31(2): 155–177.
- Paswan, A., Guzmán, F. & Lewin, J. 2017. Attitudinal determinants of environmentally sustainable behavior. *Journal of Consumer Marketing*, 34(5): 414–426.
- Pebley, A.R. 1998. Demography and the environment. *Demography*, 35(4): 377–389.
- Peeples, J. 2015. Discourse/Rhetorical analysis approaches to environment, media and communication. In A. Hansen & R. Cox (eds.), *The Routledge Handbook Of Environment And Communication* (first ed.). New York, NY: Routledge, 39–48.
- Philip, K., Tsedu, M. & Zwane, M. 2014. The impact of social and economic inequality on economic development in South Africa. Pretoria: UNDP (United Nations Development Programme).
- Phuphisith, S., Kurisu, K. & Hanaki, K. 2016. Insight into pro-environmental behaviors and people's perceptions in Bangkok, Thailand. *Journal of Environmental Information Science*, 45(5): 9–20.
- Picard, C.H. 2003. Post-apartheid perceptions of the Greater St Lucia Wetland Park, South Africa. *Environmental Conservation*, 30(2): 182–191.
- Pillmann, W. 2002. Environmental communication: Systems analysis of environmentally related information flows as a basis for the popularization of the framework for sustainable development. In *Umweltinformatik 2000*, 14. Int. Symposium Umweltinformation für Planung, Politik und Öffentlichkeit, 1–14. Marburg.
- Pisano, I. & Lubell, M. 2017. Environmental behavior in cross-national perspective: A multilevel analysis of 30 countries. *Environment and Behavior*, 49(1): 31–58.
- Plavsic, S. 2013. An investigation of gender differences in pro-environmental attitudes and behaviors. University of Connecticut. Unpublished Honours thesis
- Pleasant, A., Good, J., Shanahan, J. & Cohen, B. 2002. The literature of environmental communication. *Public Understanding of Science*, 11: 197–205.
- Query, A. 2005. Public opinion on the environment: The role of perceived efficacy, environmental concern, and self-interest in environmentally-responsible consumer behavior. Columbia University. Unpublished Master's thesis.
- Rademakers, L. 2004. Examining the handbooks on environmental journalism: A qualitative document analysis and response to the literature. University of South Florida: Graduate Theses and Dissertations.
- Rajapaksa, D., Islam, M. & Managi, S. 2018. Pro-environmental behavior: The role of public perception in infrastructure and the social factors for sustainable development. *Sustainability*, 10(4): 1–14.
- Raudsepp, M. 2001. Some socio-demographic and socio- psychological predictors of environmentalism. *Trames*, 5(4): 355–367.
- Rauwald, K.S. & Moore, C.F. 2002. Environmental attitudes as predictors of policy support across three countries. *Environment and Behavior*, 34(6): 709–739.
- Reddy, V., Juan, A., Hannan, S., Arends, F., Gastrow, M. & Roberts, B. 2013. Science awareness, attitudes and astronomy: Continuity and changes. *South African Social Attitudes Survey: Department of Science and Technology*.
- Ren, Q. & Folta, E. 2016. Evaluating environmental interpretation with mixed method: A case study at the International Crane Foundation, Wisconsin. *Journal of Interpretation Research*, 21(2): 5–19.

- Rhead, R. 2015. Concern for the natural environment and its effect on pro-environmental behaviour amongst the British Public. University of Manchester. Unpublished Doctoral dissertation
- Robinson, O.C. 2014. Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative Research in Psychology*, 11(1): 25–41.
- Rogan, R., O'Connor, M. & Horwitz, P. 2005. Nowhere to hide: Awareness and perceptions of environmental change and their influence on relationships with place. *Journal of Environmental Psychology*, 25(2): 147–158.
- Röschel, L. 2016. Perception of environmental changes and its effects on food security and water availability: A case study in rural Tanzania. Humboldt-University of Berlin. Unpublished Doctoral dissertation
- Röschel, L., Graef, F., Dietrich, O. & Schaefer, M.P. 2016. German sustainability development report: Individual perception of environmental change as supplement to big data. Policy brief.
- Rousseau, G.G. & Venter, D.J.L. 2001. A multi-cultural investigation into consumer environmental concern. *Journal of Industrial Psychology*, 27(1): 1–7.
- RSA (Republic of South Africa). 1998. National Environmental Management Act. Act, No. 107 of 1998. *Government Gazette*, 401(19519). Retrieved from https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act107.pdf
- Running, K., Burke, J. & Shipley, K. 2017. Perceptions of environmental change and climate concern among Idaho's farmers. *Society & Natural Resources*, 30(6): 659–673.
- Ruttan, V.W. 1993. Population growth, environmental change, and innovation: Implications for sustainable growth in agriculture. In C. Jolly & B. Torrey (eds.), *Population and land use in developing countries*. Washington, DC: National Academy Press, 124–156.
- Samdahl, D.M. & Robertson, R. 1989. Social determinants of environmental concern. *Environment and Behavior*, 21(1): 57–81.
- Sampei, Y. & Aoyagi-Usui, M. 2009. Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change*, 19(2): 203–212.
- SAPA (South African Press Association). 2012. Census: More TVs than fridges in SA homes. Retrieved from <https://www.iol.co.za/news/south-africa/census-more-tvs-than-fridges-in-sa-homes-1414075> [Accessed 20 November 2017].
- Scalia, A.M. 2017. The influence of sociodemographic, location, and health characteristics on environmental risk perception. Clemson University. Unpublished MSc thesis.
- Schäfer, M.S., Fuchslin, T., Metag, J., Kristiansen, S. & Rauchfleisch, A. 2018. The different audiences of science communication: A segmentation analysis of the Swiss population's perceptions of science and their information and media use patterns. *Public Understanding of Science*: 1–21.
- Schäfer, M.S. & Schlichting, I. 2014. Media representations of climate change: A meta-analysis of the research field. *Environmental Communication*, 8(2): 142–160.
- Schaffrin, A. 2011. No measure without concept. A critical review on the conceptualization and measurement of environmental concern. *International Review of Social Research*, 1(3): 11–31.
- Schahn, J. & Holzer, E. 1990. Studies of individual environmental concern: The role of environmental knowledge, gender and background variables. *Environment and Behavior*, 22(6): 767–786.

- Schlegelmilch, B.B. & Diamantopoulos, A. 1996. The link between green purchasing decisions and measures of environmental consciousness. *European Journal of Marketing*, 30(5): 35–47.
- Schultz, P.W. 2000. Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues*, 56(3): 391–406.
- Schultz, P.W. & Zelezny, L.C. 1998. Values and proenvironmental behavior: A five-country survey. *Journal of Cross-Cultural Psychology*, 29(4):, 540–559.
- Schultz, P.W. & Zelezny, L.C. 1999. Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology*, 19, 255–265.
- Science Communication Unit. 2014. Science for environment policy future brief: Public risk perception and environmental policy. Bristol.
- Scott, S. & Fern, K.W. 1994. Environmental attitudes and behaviour: a Pennsylvania Survey. *Environment and Behavior*, 26(2): 239–260.
- Screen Africa. 2015. South African TV households will grow 10% by 2018. Retrieved from <http://www.screenafrica.com/page/news/television/1656037-South-African-TV-households-will-grow-10-by-2018#.WhKQ7EqWY2w> [Accessed 20 November 2017].
- Shanahan, J. & McComas, K. 1997. Television's portrayal of the environment: 1991–1995. *Journalism and Mass Communication Quarterly*, 74(1): 147–159.
- Shanahan, J., Morgan, M. & Stenbjørre, M. 1997. Green or brown? Television and the cultivation of environmental concern. *Journal of Broadcasting and Electronic Media*, 41(3): 305–323.
- Sharma, H K. 2016. Environmental awareness and practices in Bulandshahr. *Imperial Journal of Interdisciplinary Research*, 2(11): 1922–1926.
- Shen, J. & Saijo, T. 2007. The socioeconomic determinants of individual environmental concern : Evidence from Shanghai data. OSIPP discussion paper. Osaka University, Osaka
- Shen, J. & Saijo, T. 2008. Reexamining the relations between socio-demographic characteristics and individual environmental concern: Evidence from Shanghai data. *Journal of Environmental Psychology*, 28, 42–50.
- Simon, R.J. 1971. Public attitudes toward population and pollution. *The Public Opinion Quarterly*, 35(1): 93–99.
- Soomai, S.S. 2012. The use and influence of scientific information in environmental policy making: Lessons learned from Nova Scotia. *Proceedings of the Nova Scotian Institute of Science*, 47(1): 155–170.
- South African Book Development Council. 2016. National survey into the reading and book reading behaviour of adult South Africans 2016. Retrieved from <http://sabookcouncil.co.za/wp-content/uploads/Final-Report-NRS-2016.pdf> [Accessed 28 March 2018].
- Stamm, K.R., Clark, F. & Eblacas, P.R. 2000. Mass communication and public understanding of environmental problems: The case of global warming. *Public Understanding of Science*, 9(3): 219–237.
- Stats SA (Statistics South Africa). 2011. Stellenbosch. Retrieved from http://www.statssa.gov.za/?page_id=993&id=stellenbosch-municipality [Accessed 28 April 2016].
- Stats SA (Statistics South Africa). 2015. Census 2011: Income dynamics and poverty status of households in South Africa. Pretoria.
- Stats SA (Statistics South Africa). 2016. STATS SA: Interactive graphs. Retrieved from http://cs2016.statssa.gov.za/?page_id=270 [Accessed 13 October 2016].

- Steel, B.S. 1996. Thinking globally and acting locally: Environmental attitudes, behaviour and activism. *Journal of Environmental Management*, 47(1): 27–36.
- Stefanexcu, F. & Baltatexcu, S. 2013. The perception regarding the urban environment in Romanian cities. *Transylvanian Review of Administrative Sciences*, 40: 222–240.
- Stern, P.C. 1992. What psychology knows about energy conservation. *American Psychologist*, 47(10): 1224–1232.
- Stern, P.C. 2000. Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3): 407–424.
- Stern, P.C. & Dietz, T. 1994. The value basis of environmental concern. *Journal of Social Issues*, 50(3): 65–84.
- Stern, P.C., Kalof, L., Dietz, T. & Guagnano, G.A. 1995. Values, beliefs, and proenvironmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology*, 25(18): 1611–1636.
- Struwig, J. 2010. South Africans' attitudes towards the environment. In B. Roberts, M. W. Kivilu & Y. D. Davids (eds.), *South African social attitudes: The 2nd report: Reflections on the age of hope*. Cape Town: HSRC Press, 98–219.
- Sudarmadi, S., Suzuki, S., Kawada, T. & Netti, H. 2001. A survey of perception, knowledge, awareness, and attitude in regard to environmental problems in a sample of two different social groups in Jakarta, Indonesia. *Environment, Development and Sustainability*, 3: 169–183.
- Sullivan, D. & Sullivan, R. 1977. Our environmental heritage. In D. Sullivan & R. Sullivan (Eds.), *South African Environment*. Cape Town, MacDonald South Africa, 6-7.
- Swami, V., Chamorro-Premuzic, T., Snelgar, R. & Furnham, A. 2011. Personality, individual differences, and demographic antecedents of self-reported household waste management behaviours. *Journal of Environmental Psychology*, 31(1): 21–26.
- Takács-Sánta, A. 2007. Barriers to environmental concern. *Human Ecology Review*, 14(1): 26–38.
- Takahashi, B. & Selfa, T. 2015. Predictors of pro-environmental behavior in rural American communities. *Environment and Behavior*, 47(8): 856–876.
- Takala, M. 1991. Environmental awareness and human activity. *International Journal of Psychology*, 26(5): 585–597.
- Taylor, J. & Buttel, F.H. 1992. How do we know we have global environmental problems? Science and the globalization of environmental discourse. *Geoforum*, 23(3): 405–416.
- Thakadu, O.T. & Tau, O.S. 2012. Communicating environment in the Okavango Delta, Botswana: An exploratory assessment of the sources, channels, and approaches used among the Delta Communities. *Science Communication*, 34(6): 776–802.
- Thaker, J., Zhao, X. & Leiserowitz, A.A. 2017. Media use and public perceptions of global warming in India. *Environmental Communication*, 11(3): 353–369.
- The World Bank. 2006. *World Development Report 2006: Equity and development*. Washington DC: Oxford University Press.
- Tikka, P.M., Kuitunen, M.T. & Tynys, S.M. 2000. Effects of educational background on students' attitudes, activity levels, and knowledge concerning the environment. *The Journal of Environmental Education*, 31(3): 12–19.

- Tindall, D.B., Davies, S. & Mauboulès, C. 2017. Activism and conservation behavior in an environmental movement: The contradictory effects of gender. *Society & Natural Resources*, 16(10): 909–932.
- Torgler, B., García Valiñas, M.A. & Macintyre, A. 2008. Differences in preferences towards the environment: The impact of a gender, age and parental effect. *Climate Change Modelling and Policy* 18: 1–37.
- Troldahl, V.C. & Carter, R.E. 1964. Random selection of respondents within households in phone surveys. *Journal of Marketing Research*, 1(2): 71–76.
- Tryfos, P. 1998. Cluster analysis. In Tryfos, P. (ed.), *Methods for business analysis and forecasting: Text and cases*. New York, NY: Wiley & Sons, 1–23.
- Tuan, Y. 1974. *Topophilia: A study of environmental perception, attitudes, and values*. Englewood Cliffs: Columbia University Press.
- Turpie, J.K. 2003. The existence value of biodiversity in South Africa: How interest, experience, knowledge, income and perceived level of threat influence local willingness to pay. *Ecological Economics*, 46(2): 199–216.
- Van Liere, K.D. & Dunlap, R.E. 1980. The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly*, 44(2): 181–197.
- Van Weele, G. & Maree, G. 2013. *State of Environment Outlook Report for the Western Cape Province: Introductory matter*. Cape Town, Western Cape Government Environmental Affairs and Development Planning.
- Vicente-Molina, M.A., Fernández-Sainz, A. & Izagirre-Olaizola, J. 2013. Environmental knowledge and other variables affecting pro-environmental behaviour: Comparison of university students from emerging and advanced countries. *Journal of Cleaner Production*, 2: 136–144.
- Vicente-Molina, M.A., Fernández-Sainz, A. & Izagirre-Olaizola, J. 2018. Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students. *Journal of Cleaner Production*, 176: 89–98.
- Vorkinn, M. & Riese, H. 2001. Environmental concern in a local context. *Environment and Behavior*, 33(2): 249–263.
- Wakefield, S.E.L. & Elliott, S.J. 2003. Constructing the news: The role of local newspapers in environmental risk communication. *The Professional Geographer*, 55(2): 216–226.
- Walton, T. & Austin, D.M. 2011. Pro-environmental behavior in an urban social structural context. *Sociological Spectrum*, 31(3): 260–287.
- Wang, B.Z. & Cheng, Z. 2017. Environmental perceptions, happiness and pro-environmental actions in China. *Social Indicators Research*: 132, 357–375.
- Weingart, P., Engels, A. & Pansegrau, P. 2000. Risks of communication: discourses on climate change in science, politics, and the mass media. *Public Understanding of Science*, 9(3): 261–283.
- White, M.J. & Hunter, L.M. 2009. Public perception of environmental issues in a developing setting: Environmental concern in coastal Ghana. *Social Science Quarterly*, 90(4): 960–982.
- White, P.C.L., Jennings, N.V., Renwick, A.R. & Barker, N.H.L. 2005. Questionnaires in ecology: A review of past use and recommendations for best practice. *Journal of Applied Ecology*, 42: 421–430.
- White, T. 2011. *Climate change communications: Understanding people's perceptions and evaluating the effectiveness of interventions*. De Montfort University. Unpublished Honours thesis.

- Whyte, A.V.T. 1977. Guidelines for field studies in environmental perception. Paris: UNESCO.
- Willers, V.A. 1996. Environmental concern in South Africa. University of South Africa. Unpublished Doctoral dissertation.
- Witzling, L., Shaw, B. & Amato, M.S. 2015. Incorporating information exposure into a theory of planned behavior model to enrich understanding of proenvironmental behavior. *Science Communication*, 37(375): 551–574.
- Wolf, J., Adger, W.N., Lorenzoni, I., Abrahamson, V. & Raine, R. 2010. Social capital, individual responses to heat waves and climate change adaptation: An empirical study of two UK cities. *Global Environmental Change*, 20(1): 44–52.
- World Wide Worx. 2017. Internet Access in South Africa, Executive Summary. Retrieved from <http://worldwideworx.com/wp-content/uploads/2017/07/Exec-Summary-Internet-Access-in-SA-2017.pdf> [Accessed 8 January 2018].
- Xiao, C. & McCright, A.M. 2007. Environmental concern and sociodemographic variables: A study of statistical models. *The Journal of Environmental Education*, 38(2): 3–14.
- Yore, L.D., Hand, B.M. & Florence, M.K. 2004. Scientists' views of science, models of writing, and science writing practices. *Journal of Research in Science Teaching*, 41(4): 338–369.
- Zareie, B. & Jafari Navimipour, N. 2016. The impact of electronic environmental knowledge on the environmental behaviors of people. *Computers in Human Behavior*, 59: 1–8.
- Zeelie, H. 2003. Environmental concern in South Africa: An analysis of elite and public attitudes and their implications for public policy. Stellenbosch University. Unpublished MPhil dissertation.
- Zelezny, L.C., Chua, P. & Aldrich, C. 2000. Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3): 443–457.
- Zsóka, Á., Szerényi, Z.M., Széchy, A. & Kocsis, T. 2013. Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, 48: 128–138

Addenda

Addendum 1: Quantitative survey schedule

Addendum 1A: English

DATE: _____

TIME: _____

DURATION: _____ (more or less)

LOCATION: _____ (neighbourhood)

RESEARCH ASSISTANT NAME: _____

- A. If not an adult, please read: **May I speak to an adult that lives in the house?**
- B. If no adult is present, please read: **Thank you very much, I will return.**
- C. Make sure the individual is older than 18. Ask if unsure.
- D. When an **adult** arrives, please read:

Hello Sir/Madam. I'm visiting on behalf of Stellenbosch University's Centre for Research on Evaluation, Science and Technology. My name is _____. We are gathering information on people's view of the natural environment. Your house has been chosen at random for the survey. If possible, I would like to ask you some questions. It should not take longer than ten minutes.

- E. If the individual agrees please continue with:

Your participation is anonymous and I won't ask for any personal information that can identify you. You don't have to answer any question you don't want to, and your participation is entirely voluntary. The interview takes a short time and any information you provide will be confidential. If you have any questions about this survey, upon completion of the survey I will provide an email address that you can contact to get more information. Please state that you agree with this.

- F. **If yes**, start with survey.

If no, please read: **Can I come back at a more suitable time?**

If no, make a note that a house was unsuccessful and move on to the next house.

Quantitative survey

Perceptions

1. What comes to mind when you hear the words **natural environment** (write down key words)?

2. I am going to give you a list of typical problems the South African society faces. Please rate how serious you consider these problems?

1 = not serious at all, 2 = not too serious, 3 = serious, 4 = very serious

Social problem	1	2	3	4	I don't know
Poverty low income, lack of food, water and other resources					
MIV/VIGS HIV/AIDS					
Other diseases e.g. TB					
Environmental problems					
Population growth Increase in number of people that live in the country					
Crime Murder, theft, robbery, rape					
Corruption Illegal behaviour by those in power, i.e. the government					
Quality of schooling How children are being taught in schools					

Read the following definition before continuing:

“The *natural environment* includes all living and non-living things occurring *naturally* on the planet. It is an *environment* that includes the interaction between all living things. It also includes climate, weather, and *natural* resources.”

3. What do you think is the most important environmental problem in South Africa?

4. What do you think is the most important environmental problem in your community/neighbourhood?

5. How serious do you consider the following environmental problems South African is facing at the moment:

1 = not serious at all, 2 = not very serious, 3 = serious, 4 = extremely serious

Environmental problem	1	2	3	4	I don't know
Water scarcity (shortage)/drought Not enough water for people, plants and animals to survive/live					
Destruction of natural habitats Habitats are being destroyed; when natural spaces where plants and animals live are no longer able to support them Natural areas, like Jonkershoek, can't provide food and shelter to animals and plants because people destroy parts of it					
Overfishing (fish stock depletion) When fish stock is reduced below sustainable/acceptable levels; population too small to grow bigger in numbers again Groups of fish can't reproduce because people caught too much					
Invasive species (alien plants and animals) An animal or plant that is not local to specific area and can cause damage to the local environment; the plant or animal does not belong in the local area					
Fresh-water pollution Pollution that occurs in rivers and dams					
Ocean pollution Pollution that occurs in the ocean					
Terrestrial pollution (land pollution) Pollution that occurs on land					
Wildlife poaching					

Illegal capturing/killing of wild animals by people					
Endangerment of species A plant or animal that is at risk of extinction/dying out and none of this plant or animal will survive					
Climate change and global warming A change in global or regional climate/weather patterns: temperature is higher, rains less than a previous year, more drought, more storms					
Ineffective solid waste management Garbage and trash are not removed correctly and/or effectively from your community					

6. Can you name any environmental protection or improvement projects that you know of?

Information sources

7. How would you rate your knowledge on environmental issues?

1 = No knowledge, 2 = a little bit of knowledge, 3 = reasonably well informed, 4 = very informed

1	2	3	4

8. Please indicate how often you access the following sources for environmental information

1 = never, 2 = rarely, 3 = often, 4 = very regularly

Source	1	2	3	4	I don't know
Television					
Online sources Social media, blogs, informative websites					
Books					
Personal sources					

family and friends					
Magazines paper copy and online					
National campaigns pamphlets, flyers, posters provided by government					
Formal sources workshops, seminars and conferences					
Non-governmental Organisations (NGOs) community programmes					
Radio					
Newspapers paper copy and online					

Knowledge

9. Are the following statements true, false or do you not know?

Statements	True	False	I don't know
Solar power is renewable energy source			
Glass cannot be recycled			
Forest destruction causes climate change/global warming			
Carbon dioxide does not contribute to climate change			
Global warming threatens life on earth			
All living things are important to maintain ecological balance			
Natural resources do not need to be preserved for the future			

As population in an area increases, pollution decreases			
Rhinos are hunted for their horns			
Fossil fuels provide most of South Africa's energy			
Fynbos grows everywhere in South Africa			

Socio-demographic variables

Gender ☐ male ☐ female ☐ other: _____

Population group ☐ coloured ☐ black ☐ white ☐ other: _____

How old are you? _____

Where do you live? _____ (neighbourhood; can fill this in yourself)

How many years have you lived here? _____

Where were you born? _____

Are you married? ☐ yes ☐ no

If yes, are you currently living with your husband/wife/partner? ☐ yes ☐ no

Do you have any children? ☐ yes ☐ no

If yes, how many children do you have? _____

How many people in total live in the household? _____

What is your highest level of formal education?

☐ never attended school ☐ primary school ☐ grade 9/GET phase

☐ matriculated high school (grade 12) ☐ FET college (diploma)

☐ tertiary institution ☐ none

If tertiary, please specify degree and school:

If FET college, please specify where and what course:

If high school, please specify where:

If primary school, please specify where:

What is your current home language: _____?

What is your employment status?

☐ full time employed ☐ part time employed ☐ looking for work/unemployed

If workings, what is your current occupation? _____

Are you religious/have faith? ☐ yes ☐ no

If yes, to which religion/faith do you belong? _____

If yes, how often do you attend services? _____

What is the total monthly income of your household (including social grants)?

☐ no income ☐ R1 – R750 ☐ R751 – R1 500
☐ R1 501 – R4 000 ☐ R4 001 – R 7000 ☐ R7 001 – R16 500
☐ R16 501 – R33 000 ☐ R33 001 – R57 000 ☐ R57 001 – R123 500
☐ R123 501 – R196 500 ☐ R196 501 +

Do you receive a social grant? ☐ yes ☐ no

If yes, please indicate which one (more than one):

☐ older persons ☐ disability ☐ foster child
☐ care dependency ☐ child support ☐ grant-in- aid
☐ social relief of distress

We would like to do more detailed follow-up interviews. If you are willing to provide some more time for a telephonic or personal interview, please provide me with your name and telephone number and/or email address. Please be assured this information will completely be destroyed and not made public. The head researcher that will contact you is Corlia Meyer.

Name and surname: _____

Number: _____

Email: _____

Addendum 1B: Afrikaans**DATUM:** _____**TYD:** _____**TYDSDUUR:** _____ (min of meer)**PLEK:** _____ (woonbuurt)**NAVORSINGSASSISTENT:** _____**Kwantitatiewe vraelys**

Persepsies

10. Waaraan dink u as u die woorde '**natuurlike omgewing**' hoor (skryf sleutelwoorde neer)?

11. Ek gaan vir u 'n lys van tipiese problem wat die Suid-Afrikaanse samelewing ondervind lees. Sal u asb. sê hoe ernstig u dink die probleme is?

1 = glad nie ernstig nie, 2 = nie baie ernstig nie, 3 = ernstig, 4 = baie ernstig

Sosiale probleem	1	2	3	4	Ek weet nie
Armoede lae inkomste, te min kos, water en ander hulpbronne					
MIV/VIGS					
Ander siektes bv. TB					
Omgewingsprobleme					
Bevolkingsgroei toename in die getal mense wat in 'n land woon					
Misdaad Moord, diefstal, roof, verkragting					
Korrupsie Onwettige gedrag deur mense in magsposisies, bv. die regering					
Kwaliteit van skoolopleiding Hoe kinders opgelei word in skole					

Lees die volgende voor jy aangaan:

“Die **natuurlike omgewing** sluit alle lewende en nie lewende dinge in wat **natuurlik** op die planet voorkom. Dit is ‘n **omgewing** wat die interaksies tussen alle lewende dinge insluit. Dit sluit ook klimaat, weer en **natuurlike** bronne in.”

12. Wat dink u is die belangrikse omgewingsprobleem in Suid-Afrika?

13. Wat dink u is die belangrikse omgewings probleem in u gemeenskap/woonbuurt?

14. Hoe ernstig sien u die volgende omgewingsprobleme wat Suid-Afrika tans ondervind?

1 = glad nie ernstig nie, 2 = nie baie ernstig nie, 3 = ernstig, 4 = baie ernstig

Omgewingsprobleem	1	2	3	4	Ek weet nie
Water tekort/droogte Nie genoeg water vir mense, plante en diere om te oorleef nie					
Vernietiging van natuurlike habitate Habitatte word vernietig; wanneer natuurlike areas waar plante en diere bly hulle nie langer kan ondersteun nie Natuurlike areas, soos Jonkershoek, kan nie kos en skuiling voorsien aan plante en diere nie, want mense vernietig dele daarvan					
Oorbevissing (uitputting van visvoorraad) Wanneer visvoorraad verminder word verby volhoubare/aanvaarbare vlakke; die vispopulasie is te klein om weer groter te raak in getalle Groepe vis kan nie voortplant nie, want mense vang te veel					
Indringer spesies (Uitheimse plante en diere) ‘n Dier of plant wat nie plaaslik is in ‘n spesifieke area nie en kan skade rig aan die plaaslike omgewing; die plant of diere behoort nie in die plaaslike area nie					
Varswater besoedeling					

Besoedeling in riviere en damme					
Oseaan (see) besoedeling Besoedeling in oseane en die see					
Landelike besoedeling Besoedeling op land/die aarde					
Wildlewe/diere stropery Onwettige vang/moord van wilde diere deur mense					
Bedreiging van spesies 'n Plant of dier wat naby is aan uitsterwing en niks van die plant of dier sal oorleef nie					
Klimaatverandering en aardverwarming 'n Verandering in globale of streeks klimaat-/weerpatrone; temperature is hoër, reën minder as 'n vorige jaar; meer droogtes, meer storms					
Ondoeltreffende (oneffektiewe) vaste (soliede) afval bestuur Gemors en vullis wat nie reg en/of effektief van u gemeenskap verwyder word nie					

15. Kan u enige omgewingsbeskermings of -verbeteringsprojekte noem wat u van weet?

Inligtingsbronne

16. Hoe sal u u kennis van omgewingsprobleme/-sake beoordeel?

1 = geen kennis, 2 = 'n bietjie kennis, 3 = redelik goed ingelig, 4 = baie goed ingelig

1	2	3	4

17. Dui asseblief aan hoe gereeld u die volgende bronne van omgewingsinligting gebruik

1 = nooit, 2 = skaars, 3 = gereeld, 4 = baie gereeld

Inligtingsbron	1	2	3	4	Ek weet nie
Televisie					
Internet bronne Sosiale media, blogs, insiggewende webtuistes					
Boeke					
Persoonlike bronne Familie en vriende					
Tydskrifte Papierkopieë en internet					
Nasionale veldtogte Pamflette, plakkaat voorsien deur die regering					
Formele bronne Werkswinkels; seminare en konferensies					
Nie-regeringsorganisasies Gemeenskapsprogramme					
Radio					
Koerante Papierkopieë en internet					

Kennis

18. Is die volgende stellings waar, onwaar of weet u nie?

Stellings	Waar	Onwaar	Ek weet nie
Sonkrag is 'n hernubare energiebron			
Glas kan nie herwin word nie			
Woud-vernietiging veroorsaak klimaatsverandering/aardverwarming			

Koolstofdioksied dra nie by tot klimaatsverandering nie			
Aardsverwarming bedreig lewe op aarde			
Alle lewende dinge is belangrik om ekologiese balans te handhaaf/hou			
Natuurlike bronne hoef nie beskerm te word vir die toekoms nie			
Soos bevolking in 'n area toeneem, so neem die besoedeling af			
Renosters word gejag vir hul horings			
Fossielbrandstowwe voorsien Suid-Afrika van meeste van Suid-Afrika se energie			
Fynbos groei orals in Suid-Afrika			

Socio-demografiese veranderlikes

Geslag ☐ manlik ☐ vroulik ☐ ander: _____Ras ☐ kleurling ☐ swart ☐ wit ☐ ander: _____

Hoe oud is u? _____

Waar woon u? _____ (woonbuurt; onderhoudvoerder vul dit in)

Hoe lank woon u al hier? _____

Waar is u gebore? _____

Is u getroud? ☐ ja ☐ neeWoon u huidiglik met u man/vrou/lebensmaat? ☐ ja ☐ neeHet u enige kinders? ☐ ja ☐ nee**Indien ja**, hoeveel kinders het u? _____

Hoeveel mense woon in die huishouding? _____

Wat is u hoogste vlak formele opvoeding?

☐ nooit skool toe gegaan nie ☐ primêre skool ☐ Graad 9/GET fase

☐ hoërskool gematrikuleer (Graad 12) ☐ FET kollege (diploma)

☐ tertiêre instansie

Indien tersiêr, spesifiseer asb die graad en skool:

Indien FET kollege, spesifiseer asb, skool en kursus:

Indien hoërskool, spesifiseer asb waar:

Indien primêre skool, spesifiseer asb. waar:

Wat is u huidige huistaal: _____

Wat is u werkstatus?

☐ voltydse werk ☐ deeltydse werk ☐ soek vir werk/werkloos

☐ afgetree ☐ tuis-bly ouer

Indien werk, wat is u huidige werk? _____

Is u gelowig/glo u? ☐ ja ☐ nee

Indien ja, and watter geloof behoort u? _____

Indien ja, hoe gereeld woon u dienste by? _____

Wat is die totale maandelikse huishoudelike inkomste van u huishouding (insluitend maatskaplike toelae)?

☐ geen inkomste ☐ R1 – R750 ☐ R751 – R1 500

☐ R1 501 – R4 000 ☐ R4 001 – R 7 000 ☐ R7 001 – R16 500

☐ R16 501 – R33 000 ☐ R33 001 – R57 000 ☐ R57 001 – R123 500

☐ R123 501 – R196 500 ☐ R196 501 +

Ontvang u maatskaplike toelae? ☐ ja ☐ nee

Indien ja, dui asb. aan watter een (meer as een):

☐ ouderdoms ☐ ongeskiktheids ☐ pleegkind

☐ sorgafhanklikheids ☐ kindersorg ☐ grant-in-aid

[] bystands

Ons wil graag meer gedailleerde onderhoude met mense voer. As u gewillig is om meer tyd te spandeer op 'n telefoon of persoonlike onderhoud, asseblief voorsien my van u naam, telefoonnommer en/of eposadres. Wees asseblief verseker dat die inligting vernietig sal word en nie publiek gemaak sal word nie. Die hoofnavorsers wat u sal kontak is Corlia Meyer.

Naam en van: _____

Nommer: _____

Epos: _____

Addendum 1C: Xhosa

UMHLA: _____

IXESHA: _____

DURATION: _____ (more or less)

UBUNGAKANANI BEXESHA: _____ (Umyinge/ ngaphezulu okanye ngaphantsi)

INDAWO: _____ (Ebumelwaneni)

Udederhu lwemibuzo**Iimbono/iingcamango**

1. Yintoni efikayo engqondweni kuwe xa usiva igama elithi Ezemvelo (bhala gqaba gqaba)?

2. Ndizakunika uluhlu lweengxaki olujongene nazo uluntu lwaseMzantsi Afrika. Nceda ukalishe ngokunokwakho indlela ezibaluleke ngazo ezingxaki.

1 = ayinabuzaza, 2 = ayinamsebenzi kangako, 3 = inobuzaza, = ibaluleke/inobuzaza kakhulu

Iingxaki zesimo	1	2	3	4	I don't know/ andazi
Ubuhlwempu imirholo ephantsi, ukunqaba kokutya, amanzi nezinye izidingo					
HIV/AIDS Intsholongwane kaGawulayo					
Nezinye izifo e.g. TB/ umzekelo: isifo sephepha					
Iingxaki zezemvelo					
Ukwanda kwabantu Ukongezeleka kwamanani abantu abahlala elizweni					
Ulwaphulo mthetho Ukubulawa, ubusela, uphango nodlwengulo					
Urhwaphilizo					

ukungalandeli umthetho kwabo basemagunyeni, umzekelo -URhulumente					
Izinga lwezemfundo indlela abafundiswa ngayo abantwana ezikoweni					

Funda lenkcazelo elandelayo phambi kokuqhubekeka:

“Ezemvelo/Imeko yendalo iquka zonke izinto eziphilayo nezingaphiliyo **ezizenzekelayo** kwihlabathi. Iyindawo apho zonke izinto eziphilayo zixhulumanayo. Iquka ukutshintsha tshinga kwesimo sezulu nezendalo.”

3. Yintoni ocinga yeyona ngxaki yezemvelo ebalaseleyo/ephuma phambili eMzantsi Afrika?

4. Yintoni ocinga yeyona ngxaki yezemvelo ebalulekileyo kakhulu eluntwini ekuhlaleni.

5. Uzibona zinobuzaza kangakanani ezingxaki zezemvelo zilandelayo uMzantsi Afrika ojongene nazo:

1 = ayinabuzaza konke konke, 2 = ayinabuzaza kangako, 3 = inobuzaza, 4 = inobuzaza ngokumandla/kakhulu

Iingxaki zokusingqongileyo	1	2	3	4	I don't know/ andazi
Unqongophalo lwamanzi/ imbalela Ukungabikho ngokwaneleyo kwamanzi ukwanelisa abantu, izityalo nezilwanyana ukuze ziphile					
Utshatyalaliso lweendawo zokuhlala zendalo Iindawo zokuhlala ezidaliweyo ziyatshatyalaliswa khona apho izityalo nezilwanyana zihlala khona. Iindawo zendalo ezinjengeJonkershoek azisakwazi ukuxhasa izilwanyana nezityalo ngokutya nangokuseleko.					
Ukulotywa kweentlazi ngokugqithisileyo Ukuphungulwa kweentlazi ngaphantsi kwamaqondo amkelekileyo; imihlambi leyo ayikwazi kukhula ngokwamanani kwakhona. Iintlobo ntlobo zentlanzi azikwazi kuzala zande ngokuba abantu bazilobe ngokugqithisileyo.					

Izityalo nezilwanyana ezisuka kwezinye iindawo Izilwanyana okanye izityalo ezingadalelwanga kuloondawo ithile, nezinokonakalisa imvelo yalondawo ngenxa yokuba zingadalelwanga apho					
Ungcoliseko lwanzi acocekileyo Ungcoliseko olwenzeka emilanjani nasemadamini.					
Ungcoliseko lolwandle Ungcoliseko olwenzeka elwandle					
Ungcoliseko lomhlaba Ungcoliseko olwenzeka emhlabeni					
Uzingelo lwezilwanyana zasendle Ukuzingelwa nokubulawa kwezilwanyana zasendle ngokungekho semthethweni					
Ungrogriso kwimpilo yeentlobo ntlobo yezilwanyana nezityalo Izityalo nezilwanyana ezisemngiphekweni wokufa kungabikho nanye eyakuthi isinde					
Utshintsho lobumi beemozezulu kwihlabathi Utshintsho kwiimeko zemozulu kwihlabathi: amaqondo obushushu aphezulu, iimvula zinqongophale kuneminyaka edlulileyo, ukwanda kweembalela nokuxhaphaka kwezichotho					
Impato engafanelekanga kolawulo lwenkunkuma Izinto ezimdaka/udothi ezingacocwayo zimkiswe ngokufanelekileyo emphakathini					

6. Ungakhankanya naziphina iinzame ozaziyo ezenziwayo ukuphucula nokukhusela imvelo okanye ezendalo?

Imithombo yolwazi

7. Ungazibekela kweliphi inqanaba ulwazi lwakho ngemiba yezokusingqongileyo/yezendalo?
1 = akukholwazi, 2 = ulwazi oluncinane, 3 = ulwazi olungcono, 4 = ulwazi olumandla kakhulu

1	2	3	4

8. Nceda ubonise ufikelela kangakanani kulemibele yolwazi ilandelayo ngokwezendalo
1 = andizange, 2 = nqabileyo, 3 = kaninzana, 4 = kaninzi kakhulu

Kwimithombo	1	2	3	4	I don't know/ andazi
Umabonakude					
ezifumaneka ngokwezobuchephesha be-intanethi Ezoqhakamshelwano zoluntu nangokwezochwesho lweekhompuyutha					
Iincwadi					
ngeziyamene nawe izihlobo nabahlobo					
Iphephancwadi iphephandaba nangokekhompuyutha					
Imikhankaso sesizwe iincwadana ezikhutshwayo namaphekepheke anikezwa ngurhulumente					
Imithombo esemthethweni iinkomfa neesemina ezisemthethweni					
Imibutho engalawulwa ngurhulumente imibutho yasekuhlaleni					
Unomathotholo					
Amaphephandaba					

paper copy and online					
-----------------------	--	--	--	--	--

Ulwazi

9. Ingaba ezizivakalisi zilandelayo ziyinyani aziyonyani okanye awazi?

Linxelo	Nyhani	Buxoki	I don't know/ andazi
Umbane owenziwa ngamandla elanga uyahlaziyeka			
Igilasi ayiphindi isetyenziswe kwakho			
Utshatyalaliso lwamahlathi luyalubala uguquko notshitsho lweemozezulu kwihlabathi			
Umoya omdaka awunagalelo kwintshintsho zemozulu			
Iinguqu zotshitsho nobushushu kwimoyezulu kwihlabathi iyabugrogrisa ubomi emhlabeni			
Zonke izinto eziphilayo zibalulekile ukuzinzisa			
Akukho mfuneko yokuzilondoloza ezendalo ukwenzela ikamva			
Ngokuya besanda abantu endaweni, ungcoliseko luyancipha			
Rhinos are hunted for their horns Imikhombe izingelelwa iimpondo zayo			
Fossil fuels provide most of South Africa's energy			
Intyatyambo iFeyinibhosi ikhula ndawo yonke eMzantsi Afrika			

Socio-demographic variables

Isini ☐ indoda ☐ ibhinqa ☐ enyeUhlanga ☐ webala ☐ mnyama ☐ mhlophe ☐ enye:

Unganani ngobudala? _____

Uhlalaphi? _____ (Ebumelwaneni; ungakugwalisa oku ngokwakho)

Mingaphi iminyaka oyihleli apha? _____

Wawuzalelwe phi? _____

Utshatile? ☐ ewe ☐ hayi

Ukuba ewe, ingaba uhlala nomyeni/nomfazi wakho? ☐ ewe ☐ hayi

Unabo abantwana? ☐ ewe ☐ hayi

Ukuba ewe, bangaphi abantwana onabo? _____

Bangaphi bebonke abantu abahlala apha ekhaya? _____

Ngokwemfundo ufikelelele kweliphi inqanaba/ibanga?

☐ zange ndiye esikolweni ☐ isikolo samabanga aphantsi

☐ ndaliphumelela ibanga leshumi ☐ idipuloma yasekholejini

☐ isikolo semfundo enomsila ☐ akukho nanye

Ukuba ewe, nceda chaza ufundele esiphi isidanga kwesiphi isikolo:

Ukuba yiFET kholeji, nceda chaza kweyiphi usenza eziphi

izifundo _____

Ukuba sisikolo samabanga aphakamileyo, nceda chaza phi

Ukuba sisikolo samabanga aphantsi, nceda chaza phi

Loluphi ulwimi lwakho lwenkobe: _____

Umephi ngokwengqesho?

☐ ndiqesha isigxina ☐ ndiqeshwe ngokungesosigxina

☐ ndisawukhangela umsebenzi/andiqeshwanga ☐ kuhlala ekhaya umzali

☐ umhala/unhlalaphantsi

Ukuba uyasebenza, _____

Uyakholwa/uyakhonza? ☐ ewe ☐ hayi

Ukuba ewe, ukweyiphi inkolo/ukhonza phi?

Ukuba ewe, uya kangakanani kwiindibano/ecaweni? _____

Ingakanani ingeniso mali ngenyanga kwelikhaya(kuquka nezibonelelo zikarhulumente)

☐ akukho kwangeniso ☐ R1 – R750 ☐ R751 – R1 500

☐ R1 501 – R4 000 ☐ R4 001 – R 7000 ☐ R7 001 – R16 500

☐ R16 501 – R33 000 ☐ R33 001 – R57 000 ☐ R57 001 – R123 500

☐ R123 501 – R196 500 ☐ R196 501 +

Uyasifumana isibonelelo sikarhulumente? ☐ ewe ☐ hayi

Ukuba ewe, nceda chaza ufumana esiphi(ngaphezulu kwesinye)

☐ esobudala ☐ esokhubazeka ☐ esabantwana abangenabani

☐ yokuxhomekeka ☐ yenkxaso yabantwana ☐ nikezo lwenkxaso

☐ uncedo ntlalo yoluntu

Singathanda ukwenza olunye udliwano ndlebe ukulandelela olu. Ukuba uzimisele ukunikeza ngelinye ixesha silenze kwakho oludliwano ndlebe ngokwasemnxebeni okanye ubuso ngobuso, nceda ngokundinika igama lakho kunye nenombolo yomnxeba wakho. Uyaqinisekiswa ukuba zonke iinkcukacha ziyakutshatyalaliswa nya kwaye zingasayi kupapashwa. Umphandi oyintloko oyakuxhumana nawe ngu Corlia Meyer.

Igama nefani: _____

Inombolo: _____

Email: _____

Idilesi yobhalelwano ngezobuchephesha:

Addendum 2: Survey code book**The public's perception of environmental issues****Commented Codebook**

Coding categories

Code	Title	Description
N1	Interview number	Open coding with interviewer's initial and number (i.e. C01)
N2	Neighbourhood	1 = Onderpappegaaiberg, 2 = Jonkershoek, 3 = Kayamandi, 4 = Cloetesville
D1	Date	Date interview was conducted
T1	Term 1	Open coding. First term in describing the natural environment
T2	Term 2	Open coding. Second term in describing the natural environment
T3	Term 3	Open coding. Third term in describing the natural environment
P1	Poverty	Likert-scale coding. 1 = not serious at all, 2 = not too serious, 3 = serious, 4 = very serious, 0 = don't know
P2	HIV/AIDS	
P3	Other diseases	
P4	Environmental problems	
P5	Population growth	
P6	Crime	
P7	Corruption	
P8	Quality of schooling	
NP1	National problem 1	Open coding. First term in describing a national environmental problem
NP2	National problem 2	Open coding. Second term in describing a national environmental problem
LP1	Local problem 1	Open coding. First term in describing a local environmental problem
LP2	Local problem 2	Open coding. Second term in describing a local environmental problem
S1	Water scarcity/drought	Likert-scale coding. 1 = not serious at all, 2 = not too serious, 3 = serious, 4 = very serious, 0 = don't know
S2	Destruction of natural habitats	
S3	Overfishing	
S4	Invasive species	
S5	Fresh water pollution	
S6	Ocean pollution	
S7	Terrestrial pollution	
S8	Wildlife poaching	
S9	Endangerment of species	
S10	Climate change	
S11	Solid waste management	
PR1	Projects	Open coding. List of projects

KW	Knowledge	Likert-scale coding. 1 = no knowledge, 2 = a little bit of knowledge, 3 = reasonably well informed, 4 = very informed, 0 = don't know
I1	Television	Likert-scale coding. 1 = never, 2 = rarely, 3 = often, 4 = very regularly, 0 = don't know
I2	Online sources	
I3	Books	
I4	Personal sources	
I5	Magazines	
I6	National campaigns	
I7	Formal sources	
I8	NGOs	
I9	Radio	
I10	Newspapers	
K1	Solar power	True or False 1 = True 0 = False 2 = Don't know
K2	Glass recycling	
K3	Climate change and forest destruction	
K4	Climate change and CO ₂	
K5	Global warming	
K6	Ecological balance	
K7	Natural resources	
K8	Population and pollution	
K9	Rhino poaching	
K10	Fossil fuels	
K11	Fynbos	
G	Gender	1 = Male 2 = Female 3 = Unknown
E	Population group	1 = White 2 = Black 3 = Coloured 4 = Other 5 = Unknown
A	Age	1 = 18 – 29 2 = 30 – 39 3 = 40 - 49 4 = 50 – 59 5 = 60 + 6 = Unknown
M1	Married	1 = Yes 2 = No 3 = Unknown
M2	Living with partner	1 = Yes 2 = No 3 = Unknown

C1	Children	1 = Yes 2 = No 3 = Unknown	
C2	Number of children	Open coding	
H	Household size	Open coding	
ED	Education level	0 = None 1 = Primary school 2 = Grade 9/GET 3 = High school 4 = FET 5 = Tertiary 6 = Unknown	Recoded: 0 = None 1 = Primary to high school 2 = FET and tertiary 3 = Unknown
D	Degree	Open coding	
L	Home language	1 = Afrikaans 2 = English 3 = isiXhosa 4 = Other 5 = Unknown	
O1	Employment	1 = Full time 2 = Part time 3 = Unemployed/looking for work 4 = Retired 5 = Stay at home parent 6 = Student 7 = Unknown	
R1	Religion	1 = Yes 2 = No 3 = Unknown	
R2	Religion type	Open coding	
I	Income	0 = No income 1 = R1 – R750 2 = R752 – R1 500 3 = R1 501 – R4 000 4 = R4 001 – R 7 000 5 = R7 001 – R16 500 6 = R16 501 – R33 000 7 = R33 001 – R57 000 8 = R57 001 – R123 500 9 = R123 501 – R196500 10 = R196 501 + 11 = Unknown	Recoded: 0 = No income 1 = R1 – R4 000 2 = R4 001 – R16 500 3 = R16 501 – R57 000 4 = R57 001 +
SG1	Social grant	1 = Yes 2 = No 3 = Unknown	
SG2	Social grant type	1 = Older persons 2 = Disability	

		<p>3 = Foster child</p> <p>4 = Care dependency</p> <p>5 = Child support</p> <p>6 = Grant-in- aid</p> <p>7 = Social relief of distress</p>
--	--	---

Addendum 3: Field assistant confidentiality agreement

Confidentiality agreement for fieldwork assistant for research project titles: Public perception and understanding of environmental challenges: determining the influencing factors

The information gathered during this assistantship will only be used for the research purposes of the project stated above, by the main researcher, Corlia Meyer.

Confidentiality of information gathered:

No use. The fieldwork assistant agrees not to use the Confidential Information in any way, or to manufacture or test any product embodying Confidential Information, except for the purpose set forth above.

No disclosure. The fieldwork assistant agrees to use its best efforts to prevent and protect the Confidential Information, or any part thereof, from disclosure to any person other than the main researcher.

Protection of secrecy. The fieldwork assistant agrees to take all steps reasonably necessary to protect the secrecy of the Confidential Information, and to prevent the Confidential Information from falling into the public domain or into the possession of unauthorized persons.

Fieldwork assistant

Signed: _____

Name: _____

Main researcher

Signed: _____

Name: _____

Date: _____

Addendum 4: Field assistant indemnity form

Indemnity and Exclusion of Liability

This document is very important, because it limits your ability (and that of any third party) to bring a claim against the Centre for Research on Evaluation, Science and Technology (“CREST”), Corlia Meyer and Stellenbosch University, its representatives and employees for any loss which you may suffer as a result of your participation as field assistant in the **Public perception and understanding of environmental challenges: determining the influencing factors Study** (“the Study”), taking place in Kayamandi, Cloetesville, Onderpappegaaiberg and the Jonkershoek area (“the Study Areas”).

Please note that no insurance has been taken out on your behalf and that this is your responsibility.

If you do not understand any part of this document you must request an explanation.

I, (full name and surname) _____ agree to the terms which are set out in this document.

I acknowledge that

By taking part in the study I will be exposing myself to certain risks and hazards inherent to visiting the Study Areas and the activities which will be included as part of the Study. I accept these risks inherent in my participation in the Study and I voluntarily assume responsibility for them;

I do not have any medical conditions which would make me unfit to participate in the Study;

I have investigated and taken all the necessary precautions to prevent these risks and hazards;

I will follow the rules of the Study and will follow any instructions given to me by CREST, Corlia Meyer or other persons in positions of authority;

CREST, Corlia Meyer, Stellenbosch University its representatives and employees and all other parties which took part in the planning and execution of the Study *do not have a duty of care* towards me in connection with my participation in Study and that I am responsible for my own safety; and that

I will be liable for any loss which may result from my participation in the Study or from my behaviour during the Study and that this includes any claims by any third party (including my parents or guardians, my dependants or any other third party to whom I have caused any harm).

I indemnify and hold **CREST, Corlia Meyer, Stellenbosch University its representatives and employees and all other parties** which took part in the planning and execution of the Study harmless (i.e. I will assume all liability/responsibility) against any claim which I or any third party may have arising out of my participation in the Study or in any related activities irrespective of whether such claim or claims arose through the

negligence of any person, or from any of the risks and hazards inherent in the participation in a Study of this nature, or from any other cause.

I undertake not to institute any claims against **CREST, Corlia Meyer, Stellenbosch University its representatives and employees** and not to hold any of the aforementioned Parties liable for any loss of any nature whatsoever that I may sustain as a direct or indirect result of my participation in the Study. I also indemnify and hold **CREST, Corlia Meyer, Stellenbosch University its representatives and employees** harmless against any claim which any third party may have arising out of my participation in the Study or in any related activities irrespective of whether such claim or claims arose through the negligence of any person, or from any of the risks and hazards inherent in a Study of this nature, or from any other cause.

I understand that **no insurance** has been taken out on my behalf and that this is my own responsibility.

This undertaking **applies equally to your parent or guardian (where relevant)** who must also sign it on their own behalf. This means that your parent or guardian will also not be able to bring any claim against **CREST, Corlia Meyer, Stellenbosch University its representatives and employees, all other parties** which took part in the planning and execution of the Study and that they too indemnify and hold these parties harmless against any claims from third parties.

Signature of student / participant _____ on (date) _____.

Signature of parent or guardian (on their own behalf and on behalf of the minor student, if that is the case)
_____ on (date) _____.

Addendum 5: Survey verbal consent form



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY
jou kennisvennoot • your knowledge partner

THIS IS A VERBAL CONSENT FORM AND TO PROTECT ANONYMITY, NO SIGNATURE WILL BE TAKEN.

STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

Dear Sir/Madam

My name is (Stated by assistant) I would like to invite you to participate in a research project entitled: *People's perceptions about environmental challenges*. It should not take up a lot of your time.

Thank you for being willing to participate in this study. We are conducting these interviews to get to know something about your ideas and perceptions environmental challenges. This will help make improvements to existing research. We will be delighted if you agree to take part in this interview; we could not do our research without you. The survey should not take more than 15 minutes and your responses are completely anonymous. Please be assured that there are no bad or wrong answers. If you do not feel comfortable answering a specific question, please just let us know; you do not need to answer it if you feel uncomfortable. Your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. Your answer will be recorded on a paper, by me and it won't be able to be traced back to you. If you verbally agree to take part in the survey, we can begin

- The main researcher is trying to determine how people feel about environmental problems in South Africa, but due to the nature and purpose of the survey, I cannot give you more information about the research project. It is about your opinions, and all answers are considered correct and valuable to the research.

If you have any questions or concerns about the research, please feel free to contact....

Corlia Meyer – 0723760810; corliameyer@sun.ac.za

RIGHTS OF RESEARCH PARTICIPANTS: You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

You have right to receive a copy of the Information and Consent form.

Addendum 6: Qualitative interview questionnaire

Addendum 6A: English

1. Please tell me a little bit about yourself.
2. Is there anything specific you like about the environment or nature?
3. Do you appreciate spending time in nature and the outdoors?
 - a. **If yes**, what kind of activities do you enjoy?
 - b. **If yes**, how often do you take part in such an activity?
4. Have you experienced any changes in your surrounding natural environment?
 - a. **If yes**, what kind of changes?
 - b. **If yes**, what do you think are causing these changes?
5. Can you name some environmental problems South African faces?
 - a. What do you think are the reasons for/causes of these problems?
 - b. How do you feel about these problems?
6. Are there any environmental problems you consider a threat to your family?
 - a. **If yes**, what are these problems?
 - b. **If yes**, why do you consider them a threat?
7. Would you agree that you as a person have a negative impact on the environment?
 - a. **If yes**, have you changed anything in your daily life to reduce your negative impact on the natural environment? Please elaborate.
 - b. **If no**, why not?
8. Are you involved in any pro-environmental/environmentally friendly activities inside or outside of your household?
 - a. Please explain/elaborate.
 - b. **If yes**, do you think you do enough to help the environment?
9. Please indicate how often you take part in these activities:
 - a. Please explain why/why not.

1 = never, 2 = rarely, 3 = often, 4 =regularly

Activity	1	2	3	4	I don't know
Reduce electricity consumption by turning off lights and using appliances more efficiently					
Make an effort to reduce water consumption					
Avoid buying products with excessive packaging					
Volunteer for an environmental organization					
Make use of a recycling facility					

Prefer to shower rather than take a bath

Reuse plastic bags

Walk short distances rather than use transport

Participate in outdoor recreational activities (e.g. camping and fishing)

Take part in environmental protests

Sign environmental petitions

Visit national parks

10. Do you think the environment is important in maintaining the wellbeing of humans and society?

a. Please explain/elaborate

11. Do you think South Africans need to worry about the impact of environmental problems on their livelihoods?

a. Please explain.

12. Do you think the government is spending enough money on the environment?

a. Please explain.

13. Do you think the government is doing enough to create awareness about the environment and environmental problems?

a. Please explain.

14. Where do you get your information about the environment from, if you get any information?

15. Were you educated about the environment during your school years?

16. Do you think environmental issues are covered enough in the media?

a. **If no**, what would you like to see more of?

b. **If yes**, what kind of information do you receive?

17. Please indicate your level of agreement with the following statements

a. Please explain why/why not

1 = disagree, 2 = somewhat agree, 3 = agree, 4 = strongly agree

Statement	1	2	3	4	I don't know
-----------	---	---	---	---	--------------

Taxes should be increased to protect the natural environment

Individuals cannot do a lot to protect the environment

Environmental education is very important

All life on earth has the right to exist

People should not worry about the future of the environment

Climate change/global warming is a scare tactic by environmentalists

The quality of the environment has an impact on our health.

Humans are mostly responsible for environmental change

My livelihood is negatively affected by environmental problems

There are more important things than the environment

Media information about the environment is correct

18. Do you have any other comments about what was asked during the interview?

Addendum 6B: Afrikaans

1. Vertel my asseblief bietjie meer van uself.
2. Is daar enige iets spesifiek waarvan u hou oor die omgewing of die natuur?
3. Waardeer u dit om tyd buite in die natuur te spandeer?
 - a. **Indien ja**, watter tipe aktiwiteite geniet u?
 - b. **Indien ja**, hoe gereeld neem u deel aan hierdie aktiwiteite?
4. Het u al enige veranderinge ondervind in u omliggende natuurlike omgewing
 - a. **Indien ja**, watter tipe verandering?
 - b. **Indien ja**, wat dink u veroorsaak hierdie veranderinge?
5. Kan u enige omgewingsprobleme noem wat Suid-Afrika ondervind?
 - a. Wat dink u is die redes/oorsake vir die probleem?
 - b. Hoe voel u oor die probleme?
6. Is daar enige omgewingsprobleme wat u as 'n bedreiging sien vir u en u familie?
 - a. **Indien ja**, wat is die probleme?
 - b. **Indien ja**, hoekom sien u dit as 'n bedreiging?
7. Stem u saam dat as 'n mens het u 'n negatiewe impak op die omgewing?
 - a. **Indien ja**, het u enige iets in die daaglikse lewe verander om u negatiewe inmpak op die omgewing te verminder? Brei asseblief uit.
 - b. **Indien nee**, hoekom nie?
8. Is u betrokke by enige pro-omgewings/omgewingsvriendelike aktiwiteite binne of buite die huis?
 - a. Brei asseblief uit.
 - b. **Indien ja**, dink u u doen genoeg om die omgewing te help?
9. Dui asseblief aan hoe gereeld u aan die volgende aktiwiteite deelneem:
 - a. Verduidelik asseblief hoekom of hoekom nie.

1 = nooit, 2 = min, 3 = dikwels, 4 = baie gereeld

Aktiwiteit	1	2	3	4	Ek weet nie
------------	---	---	---	---	-------------

Verminder elektrisiteitsgebruik deur ligte af te sit en
elektriese toestelle meer doeltreffend te gebruik

Doen moeite om minder water te gebruik

Vermý dit om produkte te koop met te veel verpakking

Vrywilliger by 'n omgewingsorganisasie

Maak gebruik van 'n herwinningsfasiliteit

Verkies om te stort liewer as te bad

Hergebruik van plastieksakke

Loop kort afstande liewer as om van vervoer gebruik te maak

Neem deel aan buite onspanningsaktiwiteite

Neem deel aan omgewingsproteste

Teken omgewingspetisies

Besoek nasionale parke

10. Dink u die omgewing is belangrik om die welstand van mense en die samelewing te handhaaf?

a. Brei asseblief uit

11. Dink u dat Suid-Afrikaners bekommerd moet wees oor die impak van omgewingsprobleme op ons lewensbestaan?

a. Verduidelik asseblief.

12. Dink u die regering spandeer goenoeg geld op die omgewing?

a. Verduidelik asseblief.

13. Dink u die regering doen genoeg om bewustheid te skep oor die omgewing en omgewingsprobleme?

a. Verduidelik asseblief.

14. Waar kry u u inligting oor die omgewing, indien u enige inligting kry?

15. Was u opgevoed oor die omgewing tydens u skoolgaan jare?

16. Dink u omgewingssake word genoeg gedek in die media?

a. **Indien nee**, waarvan sal u meer wil sien?

b. **Indien ja**, watter soor inligting kry u?

17. Dui asseblief aan hoe baie u ooreen stem met die volgende stellings:

a. Verduidelik asseblief hoekom of hoekom nie

1 = stem nie saam nie, 2 = stem soortvan saam, 3 = stem saam, 4 = stem baie saam

Stelling	1	2	3	4	Ek weet nie
----------	---	---	---	---	-------------

Belasting moet verhoog word om die natuurlike omgewing te beskerm

Individue kan nie baie doen om die omgewing te beskerm nie

Omgewingsopvoeding is baie belangrik

Alle lewe op aarde het die reg om te bestaan

Mense hoef nie bekommerd te wees oor die toekoms van
die omgewing nie

Klimaatsverandering/aardverwarming is 'n bangmaak
tegniek deur omgewingspesialiste

Die kwaliteit van die omgewing het 'n impak op ons
gesondheid

Mense is hoofsaaklik verantwoordelik vir omgewings
veranderinge

Mense se lewensbestaan word negatief beïnvloed deur
omgewingsprobleme

Daar is belangriker probleme as omgewingsprobleme

Media-informasie oor die omgewing is korrek

18. Het u enige ander kommentaar oor wat gevra is tydens die onderhoud?

Addendum 7: Interview information and verbal consent

Thank you for agreeing to talk to me. My name is Corlia Meyer and I am doing my PhD at CREST, SU. I am the head researcher on the project regarding people's perceptions about the environment. I am now conducting in-depth, qualitative interviews with 15 to 20 people in and around Stellenbosch. This will help make improvements on the existing research. This study has been approved by the Humanities Research Ethics Committee (HREC) at Stellenbosch University (ID: 451, Project nr: CREST-2017-0451-251) and will be conducted according to accepted and applicable national and international ethical guidelines and principles.

We are happy that you offered to take part in this interview; we could not do our research without you. The survey should not take more than 30 minutes. Before starting the interview, I would like to inform you about the following:

- Your participation is **entirely voluntary** and you are **free to decline to participate**. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you did agree to take part. If you do not feel comfortable answering a specific question, please just let us know; you do not need to answer it if you feel uncomfortable, and you can still remain in the study even if you do not answer all the questions.
- Your responses are completely anonymous. We will not ask for your name.
- Please be assured that there are **no bad or wrong answers**. Most of the questions ask for your personal opinions or feelings.
- There should be no negative effects for you. Benefits for you are to take part in an interesting research project and being provided with snacks and beverages. There will be no payment for participation.

Are you willing to participate in this study?

- IF yes: We would like to record this interview. This will allow us to refer back to the interview during our analysis. All recording will be stored anonymously and only investigated by the researchers. The data will be stored on the researchers' laptops only and there will be no data sharing. Are you fine with us recording this interview?

Addendum 8: Qualitative analysis code book**The public's perception of environmental issues****Commented Codebook**

Categories/ Code groups	Code	Description	Research question
Environmental changes	Changes	Perceived changes in natural environment	Q1, Q2, Q6, Q7
	Reasons	Reasons for perceived changes	
Environmental impact	Positive impact	Positive impact on the environment	Q1, Q2, Q6, Q7
	Negative impact	Negative impact on the environment	
	Activities	Activities to protect and conserve environment	
	Projects	Environmental organisations or projects	
Environmental problems	Problems	Environmental problems in South Africa	Q1, Q2, Q6, Q7
	Reasons	Reasons for problems	
	Concern	Concern for environment	
	Threats	Environmental threats to family	
	Solutions	Possible solutions to problems	
Government perceptions	Spending	Government spending on environment	General
	Awareness	Government environmental awareness campaigns	
Information sources	Use of sources	Sources used	Q3, Q4, Q5
	Media cover	Media coverage of environmental news	
	Knowledge	Knowledge about the environment	
Climate change	Climate change	Views on climate change	General
Health	Health	Environmental problems affecting health	General

Like about nature	Like about nature	What an individual likes about nature	General
-------------------	-------------------	---------------------------------------	---------